Working Papers

FEDERAL RESERVE BANK OF BOSTON

No. 26-15

Trade Wars on the Income Statement: The Effects of Tariffs on Firms

Omar Barbiero, Viacheslav Sheremirov, Alvaro Silva, and Hillary Stein

Abstract:
We construct firm-level exposure to the 2018 and 2025 US tariffs through own imports, suppliers' imports, and foreign retaliation, and estimate their joint effects using quarterly financial statements. Exposure is widespread and travels down supply chains, reaching firms that import little themselves. In 2025, cost exposure reduced sales and cost of goods sold equally within three quarters, by about 1.2 percent for the average direct importer and 0.5 percent through suppliers. Firms at least partly passed tariffs on to prices and shrank production rather than cutting margins. Retaliation instead compressed gross margins. The 2018 effects are small.

JEL Classifications: F13, F14, F23, F41, F62, G38
Keywords: Import tariffs, export tariffs, trade war, supply chains, firm-level evidence

The authors are members of the Federal Reserve Bank of Boston Research Department. Omar Barbiero (Omar.Barbiero@bos.frb.org) is a senior economist. Viacheslav Sheremirov (Viacheslav.Sheremirov@bos.frb.org) is a principal economist and policy advisor. Alvaro Silva (Alvaro.Silva@bos.frb.org) is an economist. Hillary Stein (Hillary.Stein@bos.frb.org) is a senior economist.

The authors thank participants of the Federal Reserve Bank of Boston's 69th Annual Economic Conference, the Spring 2026 Midwest Macro meeting, and the 2026 EEA-ESEM for useful feedback. They also thank Mary Amiti, Philippe Andrade, Pol Antràs, Falk Bräuning, Mario Crucini, Aaron Flaaen, Jeffrey Frieden, Şebnem Kalemli-Özcan, Andrei Levchenko (discussant), Giovanni Olivei, Jenny Tang, and Egon Zakrajšek for comments and suggestions. They are indebted to Sophie Handley and Lilia Qian for outstanding research assistance and Larry Bean for expert copyediting. An early version of this paper circulated under the title "U.S. Firms' Exposure to Tariffs: A Comparison of the 2018 and 2025 Episodes."

Federal Reserve Bank of Boston Research Department Working Papers disseminate staff members' empirical and theoretical research with the aim of advancing knowledge of economic matters. The papers present research-in-progress and often include conclusions that are preliminary. They are published to stimulate discussion and invite critical comments. The views expressed herein are solely those of the author(s) and should not be reported as representing the views of the Federal Reserve Bank of Boston, the principals of the Board of Governors, or the Federal Reserve System.

This paper, which may be revised, is available on the website of the Federal Reserve Bank of Boston at https://www.bostonfed.org/publications/research-department-working-paper.aspx.

This version: October 2026 **https://doi.org/10.29412/res.wp.2026.15**

1 Introduction

What happens to firms affected by tariff policies? The incidence of tariffs is usually measured at the product, border, or industry level, but many of the economically relevant effects are resolved inside firms. A company may import some goods, source other inputs from tariff-exposed domestic suppliers, sell in markets targeted by retaliation, and/or adjust prices and quantities across several lines of business. Therefore, examining firm outcomes captures the net effect of these channels after they have been aggregated through production, sourcing, and sales decisions; it also enables us to study heterogeneity across firms and to trace shocks through observed supplier linkages. We use this perspective to compare the 2018 and 2025 US tariff episodes, combining transaction-level import data, firm-to-firm supply chain data, geographic revenue data, and financial statements to measure how tariff exposure affects observed firm performance.

While some studies focus on the effects of these tariff episodes on border prices (e.g., Cavallo et al. 2021), global production networks (e.g., Huo, Levchenko, and Pandalai-Nayar 2025), or the domestic aggregate implications of recent tariffs (e.g., Amiti, Kong, and Weinstein 2020, Amiti et al. 2022), the tariff effects on US companies' effective financial performance remain underexplored. We focus on public companies because they contribute substantially to domestic aggregate production and employment and tend to be more exposed to international trade relative to private firms. In addition, the legal requirement of public companies to file quarterly financial statements guarantees high data quality.

Firms can be exposed to tariff shocks in several ways. First, import tariffs raise the direct cost of imports unless foreign suppliers fully absorb the increase in customs duties. Second, domestic production costs can rise due to higher prices set by domestic suppliers that import intermediate goods. Third, domestic exporters and multinationals face higher barriers to entering and operating in foreign markets due to retaliation practices whereby foreign governments raise tariffs on US exports.

To construct economically interpretable measures of exposure across these three channels and to understand the impact of these exposures on firms' production costs, sales, profits, and investment, we merge and homogenize several data sets. First, we merge S&P Panjiva bill-of-lading data on product-country import flows with financial statements from Compustat at the parent-company level.[1] We thus are able to construct a direct measure of each firm's import exposure to tariffs

[1]Note that the bill-of-lading data for US imports include only *maritime* transportation flows. We supplement missing land and air trade between the United States and Mexico using Panjiva Mexico exports data, which cover maritime as well as non-maritime trade. However, exports data for Canada are not available through Panjiva; hence, our import intensity measure represents a lower bound of the true measure. This limitation could be particularly important for the 2025 episode, during which substantial tariffs were imposed on Canada and on a broader set of goods for which land and air transportation may play a larger role in trade with the United States. Note also that the imports of a company identified as a subsidiary are attributed to that subsidiary's associated ultimate parent company.

based on its actual trading relationships, allowing us to compare this exposure to financial outcomes. To construct the indirect supplier exposure measure, we use Factset Supply Chain data, which comprise time-varying information on the set of large suppliers of listed companies. We link each supplier, whether private or public, to its import records from Panjiva, allowing us to trace tariff shocks through the supply chain to downstream firms. To compute exposure to foreign retaliation, we use Factset Georev to understand the foreign markets to which a company exports.

We validate our three exposure measures using two independent sources of evidence. First, we study stock returns around major tariff announcement dates and show that firms with higher exposure to each channel experienced more negative abnormal returns, consistent with financial markets pricing in the costs of tariff exposure at the firm level. Second, we construct keyword-based sentiment measures from earnings call transcripts and show that all three exposure measures are significantly associated with higher negative sentiment and perceived risk in both episodes, with the 2025 episode generating substantially more negative language and concern than 2018. Together, these results indicate that our exposure measures capture the tariff-related risks that are priced by financial markets and articulated by firm managers.

The firm-level granularity of our exposure measures allows us to document features of the two episodes that are not visible in aggregate or industry-level data. The 2025 episode, while involving roughly the same set of globally exposed companies as the 2018 episode, was a much larger shock to direct import exposure: The average tariff rate increase faced by firms in our sample was about 2.5 percentage points in 2018 compared with about 12 percentage points in 2025, and the direct import exposure measure is about 10 times larger. The supplier channel tells a similar story: The average number of affected suppliers is comparable across the two episodes, but the tariff increases those suppliers faced were far larger in 2025. These patterns—and the substantial variation across firms within each episode—are only recoverable with firm-level exposure measures linked to actual import and supply chain relationships. Foreign countries retaliated in both episodes, though the retaliatory response was proportionally smaller in 2025, since only Canada and China engaged in tit-for-tat tariff increases in both episodes.[2] All three exposure measures tend to be larger for bigger firms, reflecting the greater import and export intensity of large public companies. However, a greater number of companies, even those with a relatively low import intensity, are affected by the supplier cost channel. Regarding sectoral reach, import cost and supplier cost exposure are dispersed broadly across industries, while export retaliation exposure is concentrated mainly in manufacturing, mining, and agriculture.

We estimate the effects of tariff exposure on firms using local projections (Jordà 2005) at the firm level. We focus on the responses of nominal sales, cost of goods sold (COGS), the log ratio

[2]The European Union threatened retaliation until a deal was reached in July 2025, while China also relied more heavily on nontariff retaliatory measures in 2025.

of sales to COGS (which measures the markup under constant returns to scale), and earnings before interest, taxes, depreciation, and amortization (EBITDA) normalized by pre-period sales. A broader set of real and balance-sheet outcomes, including capital expenditure (CAPEX), complements these. Our firm-level specification allows for both firm-level and industry-time fixed effects. This empirical strategy offers several advantages over industry-level analyses or those based on equity returns around tariff announcements. First, our fixed-effects specification allows us to control for potential general equilibrium effects related to demand factors co-moving with tariffs. Second, accounting for all three channels of exposure contemporaneously allows for a tighter identification, given the high level of correlation between the exposure measures. Third, we can establish a direct and intuitive economic linkage between the exposures of US companies to foreign markets and the firm-level effects of those exposures.

Our main empirical findings are as follows. The 2018 estimates are generally close to zero across outcomes and exposure channels, with small positive and negative movements but no persistent economic pattern, apart from a decline in sales and costs of about 1 percent three quarters after the shock for firms exposed to retaliation. By contrast, the 2025 cost shocks generate a much clearer response. Sales and COGS fall together for firms exposed through their own imports or through their suppliers imports. The ratio of sales to COGS is unchanged after the impact quarter, and EBITDA falls by 0.2 to 0.5 percent of pre-period sales for directly exposed firms, in line with the lost volume, although these estimates are not statistically significant. Since the reported responses are scaled by the average exposure in each episode, this comparison should be interpreted as a comparison of the realized effects of the two tariff episodes on an average exposed firm rather than as a direct comparison of pass-through per unit of exposure.

The common thread is that cost shocks move volumes rather than markups. Whenever cost exposure moves outcomes, sales and COGS decline in roughly the same proportion, leaving their ratio unchanged, while EBITDA falls with scale. We interpret this co-movement using a standard partial equilibrium model of firm pricing and production that delivers two propositions. For the cost channels, under constant markups, a cost shock passes through proportionally to prices, and a sufficiently elastic demand response then compresses both revenues and variable costs while leaving the markup intact. This is consistent with the price pass-through evidence in the literature and implies that import tariffs reduce firm profits mainly through lower quantities rather than through lower markups. For the export retaliation channel, the model treats retaliation as a negative demand shifter. With constant markups and constant returns, this lowers sales and costs in proportion, leaving their ratio unchanged. In the data, sales fall but costs do not in the first quarters, so the ratio falls. Matching this short-run response requires something extra: firms keeping inputs through a shock they expect to be temporary, or exporters absorbing part of the tariff.

Related Literature This paper contributes to the recent literature on the effects of trade wars on the US economy. Many papers in this literature find full pass-through of import costs at the border and at least partial pass-through into domestic prices (e.g., Amiti, Redding, and Weinstein 2020, Fajgelbaum et al. 2020, Flaaen, Hortaçsu, and Tintelnot 2020, Cavallo et al. 2021, Barbiero and Stein 2025, Cavallo, Llamas, and Vazquez 2025). While we do not observe prices and therefore cannot estimate the pass-through of import costs, we contribute to this literature by providing indirect evidence on pricing behavior based on the joint responses of sales, costs, and their ratio.

Another important strand of literature focuses on the trade reallocation impact of the 2018 trade war. For example, Handley, Kamal, and Monarch (2025) find that US import tariffs led to lower exports for firms that used affected products in their production. Gopinath et al. (2025) find increased global trade fragmentation along regional blocks after 2018. Fajgelbaum et al. (2024) find that countries that were not directly involved in the trade war benefited from it due to increased export sales of affected products. Freund et al. (2024) show that, despite strong decoupling in direct trade between the United States and China after 2018, the two countries' supply chains still rely heavily on each other. Alfaro et al. (2025) show that US banks have been instrumental in channeling credit toward investment in new supplier linkages. We contribute to this literature by providing new evidence on how import tariffs could dislocate exports through retaliation and domestic production through the supplier channel.

Much of the literature on tariffs employs industry variation. For instance, Flaaen and Pierce (2024) use industry-level 2018 tariff exposure data to show that exposure to higher input tariffs and import protection are more important than foreign retaliation. They find that the tariffs, on net, lowered US manufacturing employment and raised producer prices. Our main contribution to this literature is our construction and use of firm-level tariff exposure measures, which enable us to control for time-varying industry factors and to trace the propagation of tariff shocks through supply chains to downstream firms.

Our paper relates to Amiti, Kong, and Weinstein (2020), who also use firm-level Compustat data. They identify common and idiosyncratic factor returns around trade war announcements to measure the implied effect of the 2018 trade war on investment. By contrast, we focus on realized financial outcomes and rely directly on our exposure measures to identify multiple channels of exposure from the cross section of firms.

Our paper also relates to Carreras-Valle and Lee (2026), who use bill-of-lading data from PIERS to show that firms front-ran the 2018 tariffs by increasing inventory.[3] While they focus on the effects of tariffs on firms' importing behavior, we document the effects on firm sales, costs, and profits. However, their results help interpret our results for the 2018 episode.

[3]Both PIERS and Panjiva use the same bill of lading forms to construct their dataset, they differ in how they treat and impute information. For a more detailed discussion, see Flaaen et al. (2023).

We also contribute to the literature that uses earnings calls data to analyze sentiment about tariffs. For instance, Clayton et al. (2025) construct instruments of geoeconomic pressures, such as tariffs and export controls, via large language model (LLM) querying of earnings calls. Though they focus on a wider set of policies, their methodology measures the proportion and intensity of tariff-related language rather than directly linking it to quantitative tariff and outcome measures. Our paper instead centers on quantitative measures of firm-level tariff exposure. We show that sentiment about tariffs measured from earnings calls correlates with our tariff exposure channels; that is, firms that are more exposed to tariffs view them more negatively.

We make three contributions. First, we measure tariff exposure at the firm level through three channels. These are a firm's own imports, the imports of its suppliers, and foreign retaliation against its exports. To build these measures, we combine bill-of-lading, firm-to-firm supply chain, and geographic revenue data with financial statements. Because the same firms are often exposed through more than one channel, measuring all three together lets us separate their effects. Working at the firm level also lets us control for industry-wide shocks, which industry-level studies cannot separate from tariff exposure. Second, to our knowledge, we provide the first firm-level evidence that tariffs affect firms beyond their own imports. Firms whose suppliers face higher tariffs see their sales and costs decline, even when they import little themselves. Third, we find that even among the largest US firms, sales and costs respond in a way consistent with substantial pass-through of tariffs to domestic prices. The adjustment comes through lower quantities rather than through lower margins.

The paper proceeds as follows. Section 2 describes the two tariff episodes in our analysis. Section 3 defines our tariff exposure channels in detail. Section 4 presents new stylized facts, discernible using our exposure measures. Section 5 validates our exposure measures based on stock market responses around tariff announcements and firm sentiment. Section 6 documents our main results on firm financial outcomes. Section 7 interprets these results through the lens of a standard model of firm pricing and production. Section 8 concludes.

2 Tariff Episodes

In this paper, we study two periods of increasing tariff rates in the US. The first episode began in 2018 and followed a decades-long period of generally low tariffs. This episode started with a wave of tariffs in February 2018, followed by five more waves from March until September 2018 and additional tariffs in May and September 2019. While the first three waves involved tariffs on specific products, including solar panels, washing machines, steel, and aluminum, the subsequent waves primarily targeted goods imported from China. Overall, this relatively fast and persistent

tariff implementation covered more than $350 billion of annual US imports (16 percent of total imports) at an average tariff rate increase of 15.9 percentage points. In response, some of the major US trading partners (such as Canada, China, the European Union, Mexico, Russia, and Turkey) retaliated by imposing tariffs on US exports on a comparable scale.

In 2025, another major ramping up of tariffs impacted US imports. The magnitude and breadth of this episode is unusual in several ways. First, in February and March 2025, exports from only Canada, Mexico, and China were targeted, but by April, all US trading partners had been impacted, albeit at different rates. Second, while some tariffs—including those on steel (March 12), aluminum (June 6), and automobiles (April 3)—were applied at the product level, most were applied at the country level. Third, the retaliatory effect experienced by the United States was subdued relative to the 2018 episode. Only China and Canada retaliated against the 2025 tariffs—and not broadly across product categories.

For each tariff episode, we construct monthly tariff rates at the HS6-product and country-of-origin level in two steps. First, at the HS10-country level, we compute the observed (effective) tariff rate $\tilde{\tau}_{c\tilde{p},m}$ (where $\tilde{p}$ denotes the HS10-product code and c denotes the origin country) in month m as the ratio of duties collected to the customs value of imports, using the publicly available monthly merchandise trade data from the US Census Bureau:

$$\tilde{\tau}_{c\tilde{p},m} = \frac{\text{Duties Collected}_{c\tilde{p},m}}{\text{Imports}_{c\tilde{p},m}}. \tag{1}$$

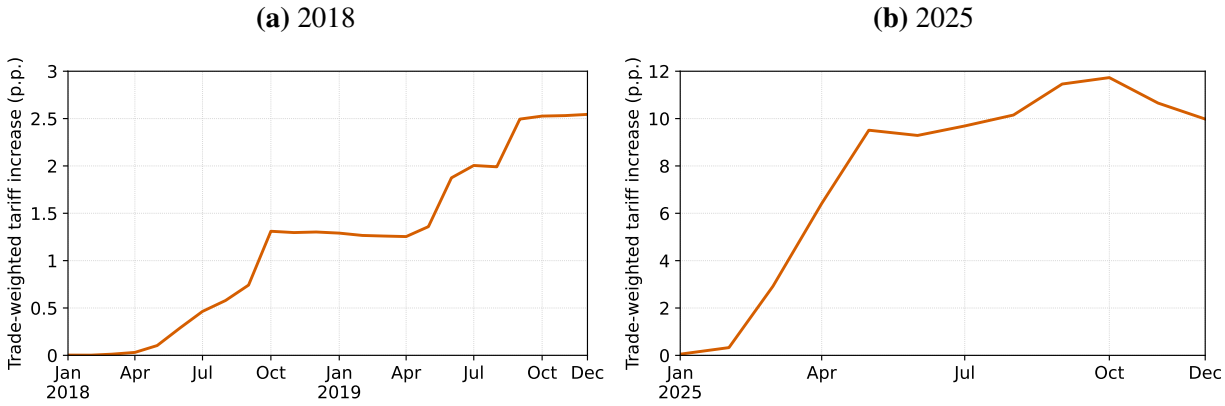
Second, we aggregate these HS10-level rates to the HS6-country level using import-value weights from a fixed pre-episode reference year (2017 for the 2018–2019 episode and 2024 for the 2025 episode):

$$\tau_{cp,m} = \sum_{\tilde{p}\in p} \omega^{\text{ref}}_{c\tilde{p}}\, \tilde{\tau}_{c\tilde{p},m}, \qquad \omega^{\text{ref}}_{c\tilde{p}} = \frac{\text{Imports}_{c\tilde{p},\text{ref}}}{\sum_{\tilde{p}'\in p} \text{Imports}_{c\tilde{p}',\text{ref}}}, \tag{2}$$

where p denotes the HS6-level product code. Conceptually, $\tau_{cp,m}$ is an effective rate that incorporates exemptions but holds trade shares fixed at their pre-episode values. Holding the within-HS6 weights at their pre-episode values purges the index of movements that arise as importers reallocate away from the tariffed HS10 lines toward exempted ones within the same HS6.

The resulting measure combines two desirable properties. Using observed rates at the HS10-by-country level captures the binding tariff schedule actually faced by importers, including the dense layer of exemptions, suspensions, and product-specific carve-outs that are particularly prevalent in the 2025 episode and that are not visible in statutory rates. It also avoids attributing economic weight to tariffs that were announced and then rescinded before any shipment cleared customs, an issue that recurs throughout 2025. Holding shares fixed at pre-episode values in the second step then ensures that the variation in $\tau_{cp,m}$ reflects changes in the rate schedule rather than

Figure 1: Cumulative Increase in Tariff Rates



Notes: This figure shows the monthly trade-weighted implemented tariff increase in US imports in 2018 and 2025. We use annual 2017 import weights for the 2018–2019 episode and annual 2024 import weights for the 2025 episode. Import tariff rate increases are effective tariff changes since January of the corresponding year at the HS10 product-country level. The day of tariff implementation is assigned to month m if it occurs 15 days before or after the first day of month m.
Sources: US Census Bureau, authors' calculations.

the endogenous response of trade flows to it.[4]

We also use statutory retaliatory tariff hikes that other countries enacted on their imports of US goods, gathering information at the country-product level.[5] For the 2018 episode, we use data from Fajgelbaum et al. (2020), who in turn source from official documents released by foreign governments. For the 2025 episode, we gather information from the Department of Finance Canada and the Ministry of Finance of China. We consider all legal exemptions declared in such notices.

Figure 1 shows the average import tariff rate in the 2018 and 2025 episodes. The first panel shows how import tariffs rose throughout the 2018–2019 episode such that by September 2019, the tariff had risen 2.49 percentage points. The 2025 episode, shown in the second panel, was characterized by a sharp tariff increase of over 9 percentage points during the first half of the year, a significantly larger increase than during the earlier episode. The tariff rate rose another few percentage points over the next couple months, peaking at 11.7 percentage points in October, before falling again over the next few months.[6]

[4]One limitation of using observed rates is timing: A tariff levied on product p from country c in month m will not appear in the data until shipments of p from c actually clear customs, which may occur in a later month.

[5]We are not able to construct effective retaliatory tariffs, since US customs does not report the duties paid to foreign countries on US exports.

[6]We do not extend our analysis to 2026 due to the US Supreme Court's decision on February 20, 2026, to strike down a substantial portion of the tariffs enacted in 2025, resulting in refunds over the following months.

3 Constructing the Tariff Exposure Measures

We consider three channels through which an increase in import tariffs can affect the cost and revenue of domestic firms. First, domestic importers face a direct increase in marginal cost associated with the higher tariffs they pay on imported goods. We call this the *direct import cost channel*. Second, domestic firms may face an increase in marginal costs due to higher prices charged by importing suppliers of intermediate goods. We call this the *importing suppliers' pass-through channel*. Third, exporters experience a decline in foreign revenue due to retaliatory tariffs imposed by foreign governments in response to US tariffs.

3.1 Direct Import Cost Channel

Our first channel of interest is the direct import cost exposure. To construct this measure, we merge the universe of US maritime trade transactions from S&P Panjiva with US Compustat firms.[7] The Panjiva data provide information on the pre-tariff value of goods imported by each listed firm f (and its subsidiaries), disaggregated by country of origin c and HS6 product-level code p. To our knowledge, this is the first paper to merge Panjiva with Compustat; we are able to merge 3,644 parent-level firms, or 2 percent of Panjiva importers and 40 percent of Compustat firms, representing 25 percent of Panjiva import value.[8]

For each country-product tariff increase $\Delta\tau_{pc,t}$ in quarter t, we define the direct import cost exposure of each consolidated firm as follows:

$$\begin{aligned}\text{Import Cost}_{f,t} &= \frac{\sum_c \sum_p \text{Imports}_{fcp,t0} \Delta\tau_{cp,t}}{\text{Costs of Goods Sold}_{f,t0}} \\ &= \underbrace{\frac{\sum_c \sum_p \text{Imports}_{fcp,t0}}{\text{Costs of Goods Sold}_{f,t0}}}_{\text{Import Intensity}_{f,t0}} \times \underbrace{\frac{\sum_c \sum_p \text{Imports}_{fcp,t0} \Delta\tau_{cp,t}}{\sum_c \sum_p \text{Imports}_{fcp,t0}}}_{\text{Change in Effective Tariff Rate}_{f,t}}. \end{aligned} \tag{3}$$

This calculation weights country-product tariff changes by the firm's exposure to that country-product. Because the entirety of the firm's costs are not imported, we divide the weighted tariff change by the firm's total cost of domestic goods sold such that the import cost exposure metric can be interpreted as the firm's marginal cost change. To prevent firms' endogenous adjustments from contaminating the exposure measure, we evaluate both imports and the cost of goods sold at their values in the year preceding each tariff episode (2017 and 2024, respectively).[9]

[7] Since Compustat generally represents consolidated financials of several subsidiaries that might be in charge of US imports, we first consolidate both variables to the ultimate parent level using quarterly subsidiary-to-ultimate-parent mapping from S&P Capital IQ.

[8] This value is calculated based on 2017 Panjiva imports.

[9] The country-product shares respond to the tariff itself, and we follow the shift-share convention of treating $\Delta\tau_{cp,t}$

Empirically, cost of goods sold is computed as global consolidated cost of goods sold, as reported by Compustat, adjusted by the firm's share of US sales, available from Factset GeoRev.[10] The tariff change in quarter t is calculated as the difference in tariff rates between the last month in quarter t and the last month in quarter $t-1$. The equation also illustrates how we decompose direct import cost exposure changes into the import intensity of the firm multiplied by the firm-specific average tariff rate applied to its imports.

3.2 Importing Suppliers' Cost Pass-through Channel

Tariffs can affect the cost of production for firms via direct purchases of foreign goods subject to tariffs or more indirectly via the supply chain. Specifically, tariffs may increase the import costs of a firm's domestic supplier, and this supplier may pass this on by charging the firm a higher price for its product.

In line with our focus on detailed firm-level information, we go beyond using input–output information at the sectoral level to measure these indirect costs (for such sectoral calculations, see Barbiero and Stein 2025). Specifically, we measure firm-to-firm linkages using data from Factset Supply Chain (formerly Factset Revere) and link each supplier to its US imports declarations as reported in Panjiva. We find that 75 percent of firms in Compustat report at least one supplier, and we link 45 percent of these suppliers to Panjiva importers.[11] We use the sales of each supplier as a normalization parameter. The sales information is generally available from both private and public companies at an annual frequency from Capital IQ. Because FactSet sources its relationships from 10-K forms, investor presentations, and other disclosure forms, the recorded links correspond to relationships skewed toward the largest counterparties. Therefore, the network is constructed using only economically significant linkages but not small or transient ones. FactSet records a linkage but quantifies its size for only about 10 percent of customer–supplier pairs, so we cannot weight suppliers by their importance to the focal firm and instead weight suppliers by their imports. The weighted average tariff exposure is computed as follows:

$$\text{Suppliers' Cost}_{f,t} = \sum_{s \in S_{f,t0}} \frac{\sum_p \sum_c \text{Imports}_{scp,t0} \Delta\tau_{cp,t}}{\text{Sales}_{s,t0}} \cdot \frac{\sum_p \sum_c \text{Imports}_{scp,t0}}{\sum_{s \in S_{f,t0}} \sum_p \sum_c \text{Imports}_{scp,t0}}, \tag{4}$$

where $S_{f,t0}$ is the set of suppliers of firm f before each tariff episode begins (from 2016 to 2017

as the exogenous shifter while holding the shares predetermined. The same logic underlies the standard practice in policy evaluation of measuring exposure at pre-policy values so that the estimand captures the effect of the policy rather than of the adjustment margins it induces. Using contemporaneous shares would bias the estimated tariff effect upward: Firms least able to substitute away from tariffed inputs would mechanically appear most exposed, and these are the same firms most likely to experience adverse outcomes for reasons tied to their inability to adjust.

[10] We compile these data for 3,065 of the (parent-level) Panjiva-Compustat merged firms.

[11] About 84 percent of Panjiva-Compustat merged firms report at least one supplier.

or 2023 to 2024). $\text{Sales}_{s,t0}$ indicates the total sales of supplier s, as reported in Factset, and $\text{Imports}_{scp,t0}$ indicates the imports of supplier s from country c of product p, as reported in Panjiva. Firms in the FactSet network whose suppliers do not import have zero supplier cost exposure; firms with no recorded supply chain links have missing exposure and are excluded from the regressions.

3.3 Export Exposure Channel

As discussed in Section 2, US exporters experienced retaliatory tariffs in both the 2018 and 2025 episodes. To account for the effect of such retaliation on exporters' foreign sales, we construct a measure that weights tariff retaliation from country c by a firm's revenue in country c. Specifically, we define the Export Retaliation Exposure index as

$$\text{Export Retaliation}_{f,t} = \frac{\sum_c \text{Revenue}_{fc,t0} \Delta\tau^*_{f\to i,c}}{\sum_c \text{Revenue}_{fc,t0}}, \tag{5}$$

where $\Delta\tau^*_{f\to i,c}$ represents the tariff applied by the foreign country c on the primary industry i to which that firm f belongs.[12] We gather detailed year-by-firm geographic revenues from Factset GeoRev.[13] Note that this geographic revenue sales measure includes both revenue coming from US exports and revenue coming from foreign subsidiaries.[14] All three exposure measures are winsorized at the 2.5 and 97.5 percentiles.

4 Descriptive Facts about Tariff Exposure

We start by providing descriptive details of our novel firm-level tariff exposure measures. This section presents three stylized facts that offer insights into firm exposure during the two tariff episodes we consider in this paper.

All descriptive statistics refer to the merged Compustat-Panjiva sample.[15] This sample presents

[12] If the industry code is specified at different levels of aggregation, we compute the export weighted average retaliatory tariff at the correct level of aggregation because our level of sales disaggregation is country-firm-time specific rather than product-country-firm-time specific.

[13] We merge 75 percent of Compustat firms to the Factset GeoRev database.

[14] Given that tariffs may be circumvented if sales are not routed via US exports, this measure captures the trade war generally but with some noise. Indeed, Amiti, Kong, and Weinstein (2020) provide suggestive evidence that the sales disaggregation may be a better proxy than export-only data for grasping the extent of the return declines for exporters. As a robustness exercise intended to reduce measurement error bias, we also test our results by constructing an indicator equivalent to Equation (5).

[15] Specifically, all descriptive statistics refer to a balanced panel related to each episode. We define a balanced panel as the firms reporting all four of our main Compustat dependent variables: costs, sales, EBITDA, and capital expenditures, in all quarters within the defined window for each tariff episode. For the first tariff episode, our balanced sample includes the 2,887 firms present in the merged Compustat-Panjiva sample from 2016:Q1 (that is, four quarters before the start of the sample) to 2019:Q4. For the second tariff episode, our balanced sample includes the 3,083 firms present from 2023:Q1 to 2025:Q4. Note that 1,959 firms are present in both panels. Before filtering for balanced panels, there are 12,008 unique parent-level firms in the data set. As described, we use the word "firm" to refer to the

several advantages for our analysis. First, as discussed, Compustat companies (and their subsidiaries) account for about 30 percent of US imports.[16] When we also include their largest direct suppliers, this accounts for 45 percent of US imports.[17] For almost half of US public companies, a substantial volume of sales come from outside the United States, leaving them highly exposed to trade wars. Available data on public companies enable us to study their activity at a quarterly frequency and with a high level of detail. Furthermore, because publicly traded companies are large, the estimated effects can be generalized to the economy as a whole.

Fact 1. *The 2025 tariff episode was characterized by both larger shocks and broader exposure.*

Table 1 shows summary statistics of our three exposure measures (that is, direct import cost, supplier cost, and export retaliation). It also provides summary statistics for the two components of direct import cost in Equation (3): import intensity in the year before the tariff shock and each firm's change in effective tariff rate over the course of the tariff episode (that is, from the end of 2017 until the end of 2019 and from the end of 2024 until the end of 2025). In the table, exposure measures are calculated once per episode using the cumulated tariff change such that each observation is a single firm.

The effective firm-level average tariff rate increase was much larger during the 2025 episode, with an increase of 11.1 percent per firm versus 3.5 percent during the 2018 episode.[18] Furthermore, a larger portion of firms in the 2025 episode experienced a positive increase in their effective tariff rate: 43 percent in 2018 versus 51 percent in 2025. A similar pattern emerges when considering each of the exposure measures. For all three, the average exposure in 2025 was higher than in 2018. A higher percentage of firms had positive values for import cost and supplier cost exposure measures in 2025, though the fraction of firms exposed via export tariffs was comparable.

Figure 2 splits average exposure by industry, conditional on firms having positive exposure. The orange dots correspond to the 2025 episode, and the green dots to the 2018 episode. Firms across industries faced higher exposures to supplier costs during the 2025 episode. This pattern also appears in import cost exposure and export retaliation exposure, though both are driven by a subset of industries.

Fact 2. *Exposure via the suppliers' pass-through channel is broader than exposure via the direct import cost channel. Exposure via export retaliation is limited to specific industries during these*

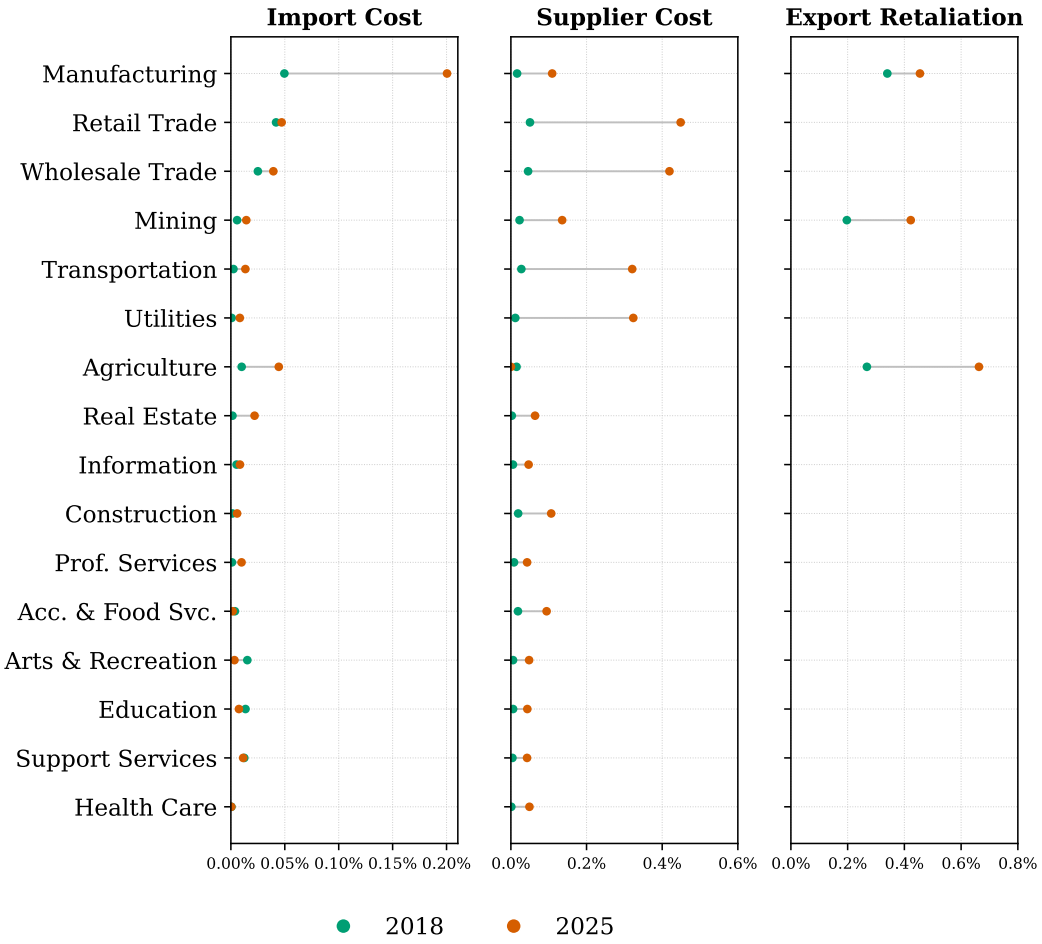
ultimate parent company.

[16]This estimate is computed as a percentage of 2017 import value in the S&P Panjiva data set for companies whose ultimate parent is available in Compustat data.

[17]The value for 2017 is estimated from S&P Panjiva as a percentage of import value of companies whose ultimate parent is in Compustat or linked directly to Compustat companies according to the Factset Supply Linkage data set.

[18]The 2018 average firm-level effective tariff rate increase is somewhat larger than the aggregate increase shown in Figure 1a. This implies a trade distribution that is skewed slightly more toward high-tariff goods in our sample than in the aggregate data. For 2025, our sample seems representative.

Figure 2: Intensive Margin of Exposure by Industry



Notes: This figure shows, for firms with positive exposure, the size of each of our three exposure measures, as defined in Section 3, split by industry. The green dots correspond to the 2018 episode, and the orange dots to the 2025 episode. Exposure measures are calculated once per episode using the entire tariff change in the episode.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Table 1: Summary Statistics for Exposure Measures

Variable	Mean	SD	%>0	Min	Median	p60	p70	p80	p90	Max
All values in percent										
Panel A: 2018 Episode (N = 2885)										
Import Intensity	3.96	10.66	57.33	0.00	0.02	0.16	0.82	3.18	10.48	53.19
Δ Tariff Rate	3.52	7.58	42.73	-0.27	0.00	0.02	1.02	4.64	13.44	32.45
Import Cost	0.14	0.39	43.33	-0.03	0.00	0.00	0.01	0.08	0.48	2.74
Supplier Cost	0.08	0.14	73.46	-0.08	0.01	0.02	0.05	0.13	0.31	0.97
Export Retaliation	0.28	0.60	29.98	0.00	0.00	0.00	0.00	0.41	1.35	3.41
Panel B: 2025 Episode (N = 3082)										
Import Intensity	3.43	9.00	54.39	0.00	0.00	0.10	0.66	2.68	9.78	44.46
Δ Tariff Rate	11.06	14.77	50.88	0.00	0.21	9.67	15.99	23.55	36.65	47.99
Import Cost	0.68	1.79	51.04	0.00	0.00	0.01	0.09	0.46	2.19	9.77
Supplier Cost	0.27	0.51	76.03	0.00	0.05	0.08	0.18	0.46	0.83	3.15
Export Retaliation	0.39	0.83	29.40	0.00	0.00	0.00	0.00	0.54	1.66	4.43

Notes: This table shows summary statistics for the three firm-level exposure measures, as defined in Section 3, as well as firm-level import intensity and firm-level tariff change. All variable values indicate percentage. Summary statistics are split by episode and only include firms in each episode's balanced sample. Tariff changes are calculated from the start of the episode until the end of the episode (that is, from the end of 2017 until the end of 2019 and from the end of 2024 until the end of 2025), and exposure measures are calculated once per episode using the entire tariff change. Thus, each observation is a single firm. The statistic "% > 0" indicates the percentage of firms with positive values of the given variable. Supplier cost statistics are computed over firms covered by the FactSet supply chain data.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

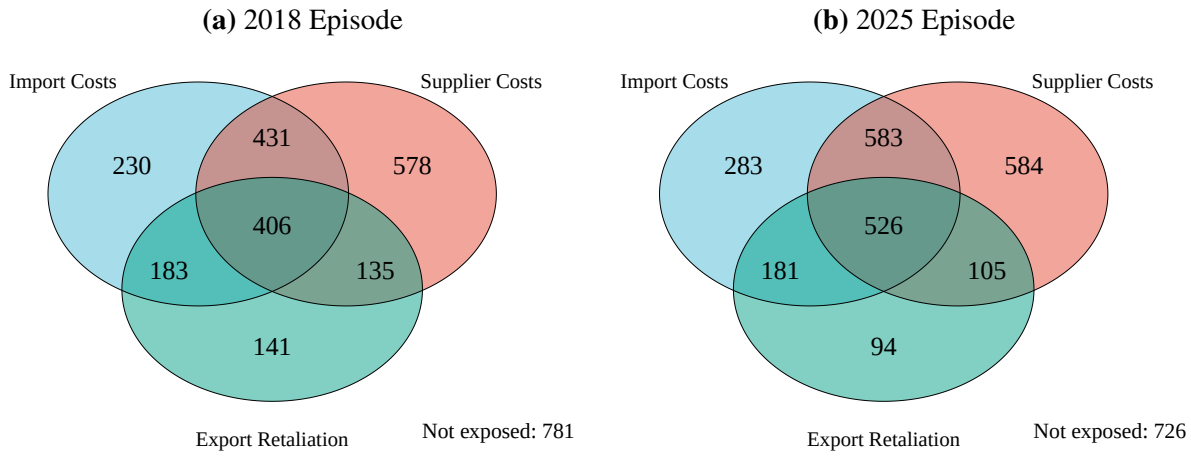
episodes.

Figure 3 shows the number of firms affected through each exposure channel in each episode. A firm is affected when it has positive exposure, calculated using the tariff change across the entire episode. In both episodes, more firms were affected by the supplier cost channel than the importer cost channel. Even if a firm did not directly import goods that were affected by the tariffs, it still may have purchased inputs from suppliers that in turn import affected goods.

Table 2 shows the average exposure by import percentile bin for each episode. The first row in each episode quantifies the average import intensity in each bin. More than half of firms in each sample have an import intensity of zero, which is not surprising, given that a large number of publicly listed companies are in the services industries. However, the top 10 percent of firms have a substantial direct import intensity. This is because our mapping of every subsidiary's trade into imports from Panjiva in any given year shows us how many multinational corporations in manufacturing, trade, mining, and technology operate globally.

Table 2 shows that exposure to suppliers' costs (row 3) is broader than exposure to direct import costs (row 2). The most import-intensive firms typically had substantially greater exposure

Figure 3: Number of Firms with Positive Exposures



Notes: This figure shows the number of firms with positive exposures for our three exposure measures, as defined in Section 3. The subfigures are split by episode and only include firms in each episode's balanced sample. Exposure measures are calculated once per episode using the entire tariff change in the episode. Thus, firms are determined to have positive exposures across the entire episode.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

to direct import costs. However, even when firms had no exposure to direct import cost changes due to lack of direct imports, they still could be exposed to supplier cost increases.

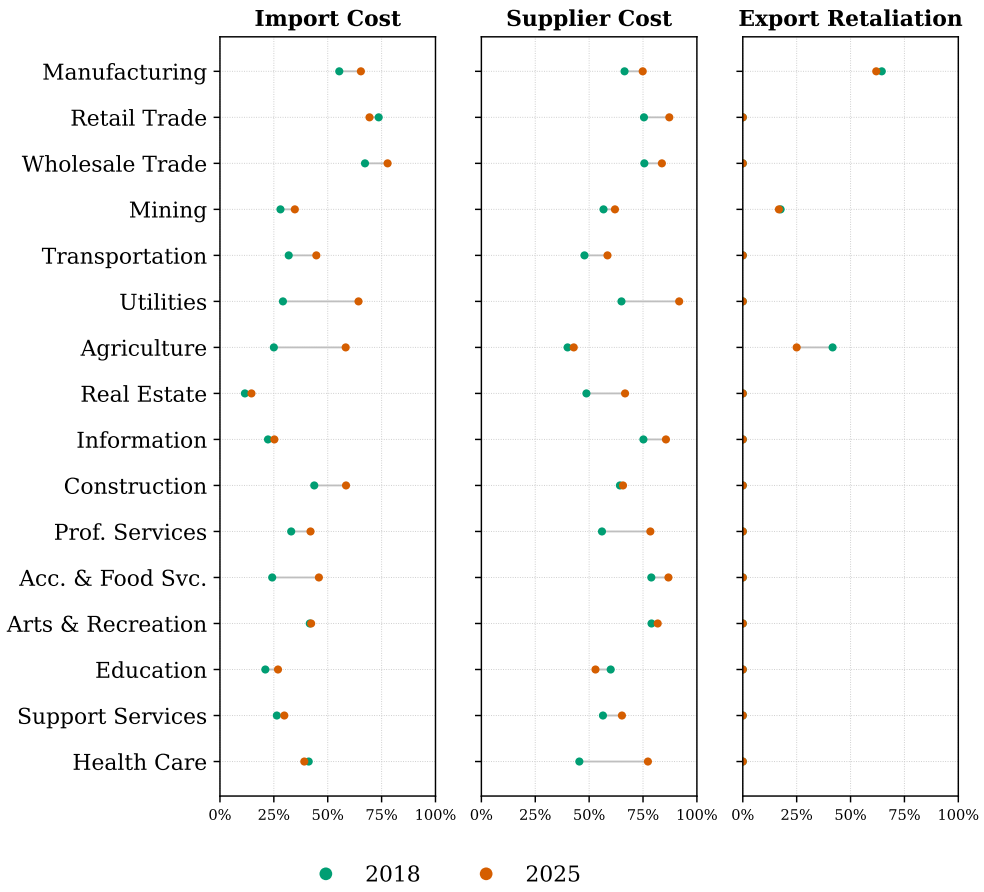
Exposure to export retaliation is much narrower (see Table 1 and Figure 3). Figure 4 shows the percentage of firms exposed to each episode by industry—the extensive margin version of Figure 2. Import cost exposure and supplier cost exposure are relatively dispersed across industries. Export retaliation exposure, however, is concentrated in manufacturing, mining, and agriculture firms. This can be explained by China's and Canada's imposing retaliatory tariffs on a relatively *narrow* set of US industries.

Fact 3. *All three exposure measures correlate with firm size.*

Table 3 splits our exposure measures by firm size, showing average exposure measures for percentile bins determined by firm employment.[19] The table illustrates that larger firms have higher import intensity, a fact supported by established literature (see, for example, Bernard et al. 2018). Accordingly, larger firms were more exposed to tariffs via the import cost channel. Supplier cost exposure also increased with firm size, despite supplier cost exposure affecting firms with varying import intensity. Finally, the correlation of export retaliation exposure with size indicates that foreign countries targeted industries that correspond to larger US firms.

[19] Appendix Table A.1 shows a similar split using firm sales, with similar results.

Figure 4: Extensive Margin of Exposure by Industry



Notes: This figure shows the percentage of firms with positive exposures for our three exposure measures, as defined in Section 3, split by industry. The orange dots denote the 2018 episode, and the green dots denote the 2025 episode. Exposure measures are calculated once per episode using the entire tariff change in the episode. Thus, firms are determined to have positive exposures during the entire episode.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Table 2: Average Exposure by Import Percentile Bin

	Import Intensity Percentile Bin			
	p0-50	p50-75	p75-90	p90-100
Panel A: 2018 Episode				
Import Intensity (%)	0.00	0.44	4.80	31.29
Import Cost (%)	0.00	0.04	0.38	0.79
Supplier Cost (%)	0.05	0.10	0.13	0.08
Export Retaliation (%)	0.09	0.27	0.66	0.71
N	1399	699	420	280
Panel B: 2025 Episode				
Import Intensity (%)	0.00	0.34	4.37	26.84
Import Cost (%)	0.00	0.10	1.24	5.00
Supplier Cost (%)	0.16	0.36	0.40	0.37
Export Retaliation (%)	0.18	0.39	0.84	0.88
N	1481	740	444	297

Notes: This figure shows the average exposure by import percentile bin for each episode. Import percentile bins are based on import intensity in the year before the episode. Supplier cost statistics are computed over firms covered by the FactSet supply chain data.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Table 3: Average Exposure by Employment Percentile Bin

	Employment Percentile Bin			
	p0-50	p50-75	p75-90	p90-100
Panel A: 2018 Episode				
Import Intensity (%)	2.38	4.63	5.73	7.31
Import Cost (%)	0.08	0.19	0.23	0.24
Supplier Cost (%)	0.04	0.07	0.09	0.16
Export Retaliation (%)	0.16	0.31	0.44	0.49
N	1443	721	432	289
Panel B: 2025 Episode				
Import Intensity (%)	2.32	3.88	5.06	5.21
Import Cost (%)	0.48	0.80	1.00	0.92
Supplier Cost (%)	0.16	0.26	0.39	0.50
Export Retaliation (%)	0.25	0.42	0.58	0.69
N	1541	773	461	307

Notes: This figure shows the average exposure by employment percentile bin for each episode. Sales percentile bins are based on employment, as in Compustat, in the year before the episode. Supplier cost statistics are computed over firms covered by the FactSet supply chain data.

Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

5 Validation of Tariff Exposure Measures

Before proceeding to our main empirical analysis, we first validate our three measures of tariff exposure. We do so in two different ways. First, we examine how these measures correlate with firm stock returns around tariff announcements, and second, we examine how they correlate with tariff risk and sentiment according to company earnings call transcripts.

5.1 Tariff Exposure and Stock Returns

Our first validation exercise compares our exposure measures to firm stock returns around tariff announcements made during each of the two episodes. If markets perceive company exposure to tariffs via direct imports, suppliers' imports, or export retaliation, this should prompt returns to fall when tariffs are announced, as long as the announcements are unexpected. For the 2018–2019 episode, we examine six days on which US tariffs were announced and five dates on which Chinese retaliatory tariffs were announced (Amiti et al. 2022).[20] For the 2025 episode, we examine 13 dates with tariff announcements, which we gather from US Federal Register notices.[21] Stock returns in a one-day window around each announcement are calculated using the equity return data set of the Center for Research in Security Prices (CRSP).[22] We aggregate subsidiary returns to the parent-firm level, in line with our exposure measures, by taking the market capitalization–weighted daily average.

Because our exposure measures are calculated at frequencies no lower than one month, we use two regression approaches to compare returns to exposure measures. First, for months with tariff announcements, we estimate panel regressions at a monthly frequency. When there are multiple announcements in a month, we average the returns around the announcements within the month. These regressions include time fixed effects, and we examine the cross section of firms around each announcement month. In our second approach, we aggregate firm returns in each episode by averaging the daily returns across all announcement dates within an episode. We then compare this average return to firm exposures, calculated using tariff changes over the course of each episode. These regressions are cross-sectional and include one observation per firm.

[20]The dates for this episode come from Amiti et al. (2022). Specifically, the six dates of the US tariff announcements were January 23, 2018 (solar panels and washing machines); March 1, 2018 (steel and aluminum); March 22, 2018 (China); June 19, 2018 (China); May 6, 2019 (China); and August 1, 2019 (China). The five dates of Chinese retaliatory tariffs were March 23, 2018; June 15, 2018; August 2, 2018; May 13, 2019; and August 23, 2019 (soy and autos).

[21]For the 2025 episode, the 13 dates are February 1, 2025 (Canada, Mexico, and China); February 10, 2025 (steel and aluminum); March 3, 2025 (China); March 26, 2025 (autos); April 2, 2025 (global, "Liberation Day"); April 8, 2025 (China); June 3, 2025 (steel and aluminum); July 30, 2025 (Brazil and copper); July 31, 2025 (multiple countries); August 6, 2025 (India); August 19, 2025 (steel and aluminum); September 29, 2025 (timber); and October 17, 2025 (medium- and heavy-duty vehicles and buses).

[22]For announcements made during trading hours, we examine the returns over the day of the announcement. For announcements made after the market closed or on a weekend, we adjust the timing accordingly.

Table 4: Co-movement of Stock Market Returns with Tariff Exposure Channels

	2018 Episode		2025 Episode	
	(1)	(2)	(3)	(4)
	Returns$_{f,t}$	Returns$_f$	Returns$_{f,t}$	Returns$_f$
Import Cost	-4.470***	-0.065***	-0.285***	-0.028***
	(0.530)	(0.013)	(0.077)	(0.005)
Suppliers' Cost	-1.099	-0.750***	-0.344	0.026
	(3.431)	(0.155)	(0.347)	(0.040)
Export Retaliation	-7.552	-0.074***	-0.017	-0.013***
	(18.271)	(0.013)	(0.014)	(0.004)
R^2	0.229	0.047	0.422	0.020
Within R^2	0.006	.	0.002	.
Time FE	✓		✓	
N	11,398	1,910	12,451	2,081
Firms	1,910	1,910	2,081	2,081

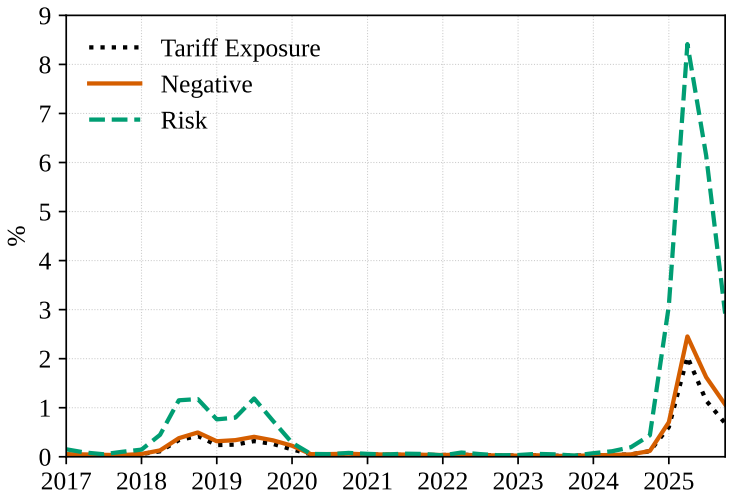
Notes: This table shows the correlation of one-day stock returns around tariff announcements with our three exposure measures, as defined in Section 3. The 2018 episode includes 11 dates, and the 2025 episode includes 13 dates. Columns (1) and (3) give the results of panel regressions at the firm-day level that include time fixed effects. Columns (2) and (4) are cross-sectional regressions that average returns across the announcement days in the episode by firm.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

The results of both approaches are shown in Table 4. Columns (1) and (3) show the results of the first approach, and columns (2) and (4) show the results of the second approach. The majority of coefficients are negative, indicating that direct import cost, supplier cost, and export exposure measures are all negatively correlated with stock returns around tariff announcements. This result is expected and helps validate our construction of these three measures.

5.2 Tariff Exposure and Firm Sentiment

We next validate our exposure measures by comparing them to the earnings call sentiment of the firms in our sample. Sentiment and textual analysis is a fruitful area of research to analyze and gather (perceived) exposure in real time (Hassan et al. 2023, 2019, Alfaro and Chor 2023). We define the following normalized sentiment measures for each earnings call of firm f at quarter t,

Figure 5: Proportion of Tariff Mentions in Earnings Calls



Notes: Average quarterly tariff mentions for US Compustat companies. *Any* mention corresponds to the average number of sentences in which the word "tariff" appears in a given call, normalized by the number of sentences in the call. *Negative* mentions count the share of sentences with negative keywords that also contain the word "tariff." *Risk* mentions count the share of sentences with risk-related keywords that also contain the word "tariff."
Sources: NL Analytics, S&P Compustat.

as in Hassan et al. (2019, 2023):[23]

$$\text{Tariff Exposure}_{ft} = \frac{\text{\# Sentences containing "tariff"}}{\text{\# Sentences}}, \tag{6}$$

$$\text{Negative Sentiment}_{ft} = \frac{\text{\# Sentences containing "tariff" and negative keyword}}{\text{\# Sentences with negative keywords}}, \tag{7}$$

$$\text{Risk Sentiment}_{ft} = \frac{\text{\# Sentences containing "tariff" and a risk keyword}}{\text{\# Sentences with risk keywords}}. \tag{8}$$

Each normalization is designed to emphasize the cross-sectional difference across companies within any given period and investigate whether it relates to our cross-sectional difference in tariff exposure.

Figure 5 presents the time series of tariff exposure, negative sentiment, and risk sentiment, averaged across the sample of all companies publishing earnings calls. The measures clearly intensify around tariff introductions. The first increase happens in mid-2018, around the time of the first wave of tariffs in the 2018–2019 episode. The second wave, applied to finished Chinese goods, is also visible in mid-2019. Notably, the 2025 episode came with a particularly higher perceived risk and also higher perceived negative sentiment and exposure.

We examine whether companies that we calculate to be exposed to tariffs also seem exposed via these textual analysis measures. We do so using the same two approaches as in Section 5.1. First, we run a panel regression at the quarterly level, in which we calculate our three exposure measures

[23] We gather mentions and bigram instances of tariffs with sentiment and risk concept from NL Analytics.

Table 5: Co-movement of Firm Sentiment with Tariff Exposure Channels, Panel

	2018 Episode			2025 Episode		
	(1) Exposure	(2) Negative	(3) Risk	(4) Exposure	(5) Negative	(6) Risk
Import Cost	3.503***	4.035***	10.250***	1.537***	1.594***	4.550***
	(0.361)	(0.478)	(1.692)	(0.102)	(0.154)	(0.519)
Suppliers' Cost	2.211***	2.316***	10.344***	1.529***	1.748***	6.232***
	(0.353)	(0.497)	(2.675)	(0.240)	(0.327)	(1.167)
Retaliation	0.532***	0.777***	1.788***	1.469***	1.591***	5.156***
	(0.138)	(0.208)	(0.468)	(0.129)	(0.196)	(0.727)
R^2	0.136	0.094	0.044	0.448	0.303	0.244
Within R^2	0.077	0.051	0.022	0.192	0.096	0.055
Time FE	✓	✓	✓	✓	✓	✓
N	33,830	33,830	33,830	30,555	30,555	30,555
Firms	1,907	1,907	1,907	2,168	2,168	2,168

Notes: The exposure, negative, and risk sentiment measures are defined as in Equations (6) through (8). Standard errors clustered at the firm level are in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, NL Analytics, authors' calculations.

using tariff changes each quarter and compare these measures to the three earnings call measures calculated from the call in a given quarter. We include time fixed effects to focus on comparisons across firms, within a quarter. Second, we run a cross-sectional regression, in which we calculate our three exposure measures using tariff changes over the course of an episode and compare it to earning call measures, averaged over the course of the episode. The results of the first approach is shown in Table 5, and the results of the second approach is shown in Appendix Table A.2. All coefficients in both tables are positive and significant, supporting the relevance of each of our three channels of tariff exposure. Firms with higher calculated import cost exposure, suppliers' cost exposure, and export retaliation exposure also perceive themselves to have higher tariff exposure and risk. They also have higher negative sentiment around tariffs, in line with the fact that all our calculated exposure measures constitute either higher costs for the firm or a negative output shock.

6 The Effects of Tariff Exposure

6.1 Empirical Strategy

We now turn to our central analysis, whereby we examine how tariff exposure affects firms' financial outcomes. To do so, we use local projections to estimate the responses of sales, COGS, and

EBITDA—as reported quarterly in Compustat—to our tariff exposure measures.[24] All dependent variables are nominal. For each response horizon h, we estimate the following specification:

$$y_{f,t+h} - y_{f,t-1} = \alpha_{f,h} + \alpha_{i,t,h} + \boldsymbol{\gamma}_h' \mathbf{z}_{f,t} + \varepsilon_{f,t,h} + \beta_h^{IC} \times \text{Import Cost}_{f,t} + \beta_h^{SC} \times \text{Supplier Cost}_{f,t} + \beta_h^{ER} \times \text{Export Retaliation}_{f,t}, \tag{9}$$

where $\alpha_{f,h}$ is a firm fixed effect, $\alpha_{i,t,h}$ is an industry-time fixed effect, $\mathbf{z}_{f,t}$ is a vector of controls that includes four lags of the dependent variable and exposure measures. To facilitate interpretation, we transform our dependent variables as follows:

$$y_{f,t} = \left\{ \log \text{Sales}_{f,t}, \quad \log \text{COGS}_{f,t}, \quad \log \text{Sales}_{f,t} - \log \text{COGS}_{f,t}, \quad \frac{\text{EBITDA}_{f,t}}{\text{Sales}_{f,t_0}} \right\},$$

where t_0 refers to the quarterly average in either 2017 or 2024, depending on the episode considered. Because the denominator of the EBITDA ratio is fixed at its pre-period value, this outcome measures the change in the level of earnings rather than in earnings per dollar of sales. Under constant returns to scale, and if COGS approximates variable costs well, the difference between log sales and log COGS equals the log markup. The coefficients of interest β_h^x, $x = \{\text{IC}, \text{SC}, \text{ER}\}$, measure the responses of the financial outcomes to the import and export shocks.

We control for concurrent exposures in our specification due to nonzero correlations between the three exposure measures. These correlations for the 2018 and 2025 episodes are shown in Figure 6. For the most part, our exposure measures are weakly positively correlated across the extensive and intensive margins for both episodes. The lone exception is that export retaliation exposure and supplier cost exposure are very weakly negatively correlated on the intensive margin in both episodes. While Section 4 shows how different exposures vary across different dimensions, such as import intensity, industry, and size, these figures show that it is nevertheless important to control for other exposures in our regressions.

6.2 Results

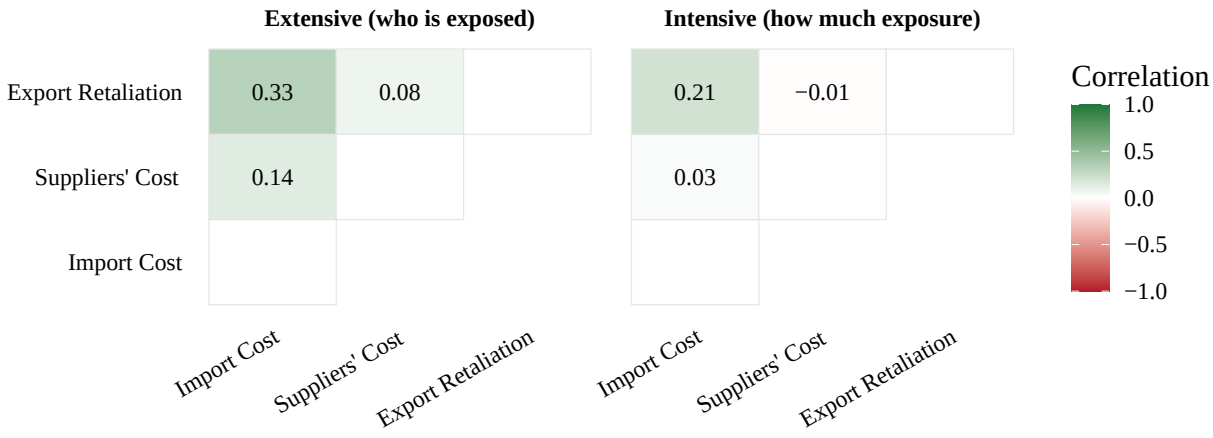
We estimate Equation (9) for the two episodes separately.[25] All results use a balanced sample in each period, restricted to firms covered by the FactSet supply chain data. To ease the interpretation of the results, we scale all coefficients by the average exposure across firms with non-missing exposure. Thus, the results can be interpreted as applying to firms with an average exposure. Throughout this section, green colors in the figures refer to the 2018 tariff episode and orange colors refer to the 2025 tariff episode. Shaded areas represent 68 percent (darker) and 90 percent

[24] Appendix C details how each variable is constructed from Compustat data.

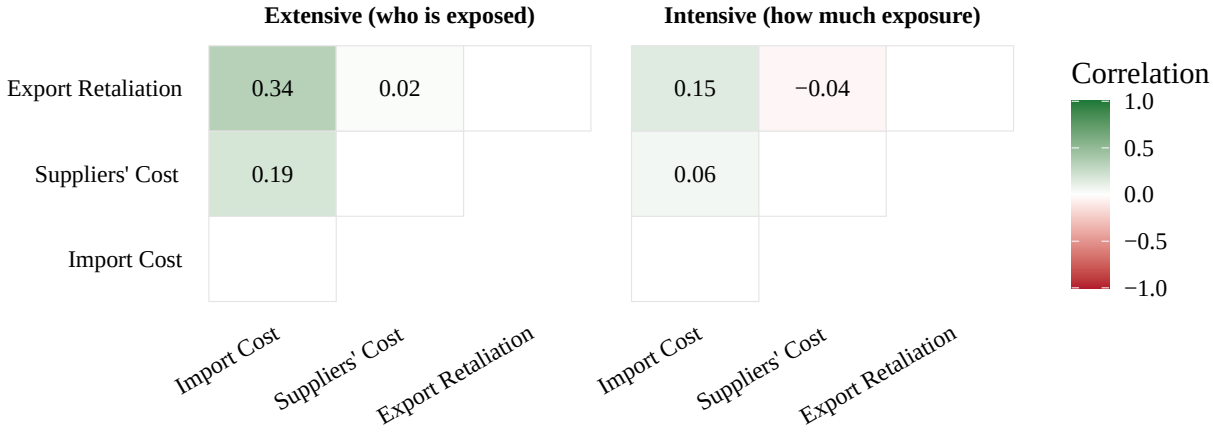
[25] To provide enough of a pre-period for our lags, we use the years 2016 through 2019 and 2022 through 2025.

Figure 6: Regression Coefficient Matrices of Exposure

(a) 2018 Episode



(b) 2025 Episode



Notes: These figures show correlation coefficients across the three exposure measures, estimated separately for the two episodes.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

(lighter) confidence bands.

Figure 7 shows the responses of firms' financial outcomes to tariff exposure via direct import costs. Panels (a) through (d) show that the responses of all our analyzed variables to a rise in import cost in the 2018 tariff episode were, on average, about zero. By contrast, both sales and COGS decreased during the 2025 episode, with the average firm experiencing a 0.6 to 1.3 percent decline in both sales and COGS. As we discuss in the next section, this similar decline in both variables is consistent with a fall in quantities and at least partial pass-through from input prices into sales prices. Panel (c) shows that the ratio of sales to COGS dips by about 0.4 percent on impact and returns to zero from the first quarter on, so firms pass the cost increase through to their prices. EBITDA, shown in panel (d), falls by 0.2 to 0.5 percent of pre-period sales, although the estimates are not statistically significant. These point estimates are close to what a 0.6 percent fall in volume at an unchanged gross margin, $(\text{Sales} - \text{COGS})/\text{Sales}$, implies (about 0.3 percent).

Figure 8 shows the responses to tariff exposure via supplier costs. The results look qualitatively similar to those shown in Figure 7. Again, we do not find any effect of supplier cost exposure on any of the outcome variables during the 2018 tariff episode. We do find negative effects on sales and COGS during the 2025 tariff episode, with declines of about 0.4 to 0.6 percent two to three quarters after the shock. The ratio of sales to COGS stays at zero throughout, and EBITDA declines by up to 0.4 percent of pre-period sales three quarters after the shock, but the estimates are not statistically significant.

Figure 9 shows the responses to export retaliation. We find evidence that export retaliation depressed sales two to three quarters after the shock during the 2018 tariff episode, by about 1 percent, with costs falling by a similar amount. In 2025, export retaliation lowered sales by more than 1 percent in the first quarters while COGS did not move. As a result, the ratio of sales to COGS falls by 1.3 to 1.5 percent over the first three quarters, and EBITDA by 1.8 to 2.5 percent of pre-period sales. Unlike the cost channels, retaliation compresses gross margins in the short run. These estimates are imprecise because exposure is concentrated in a few industries.

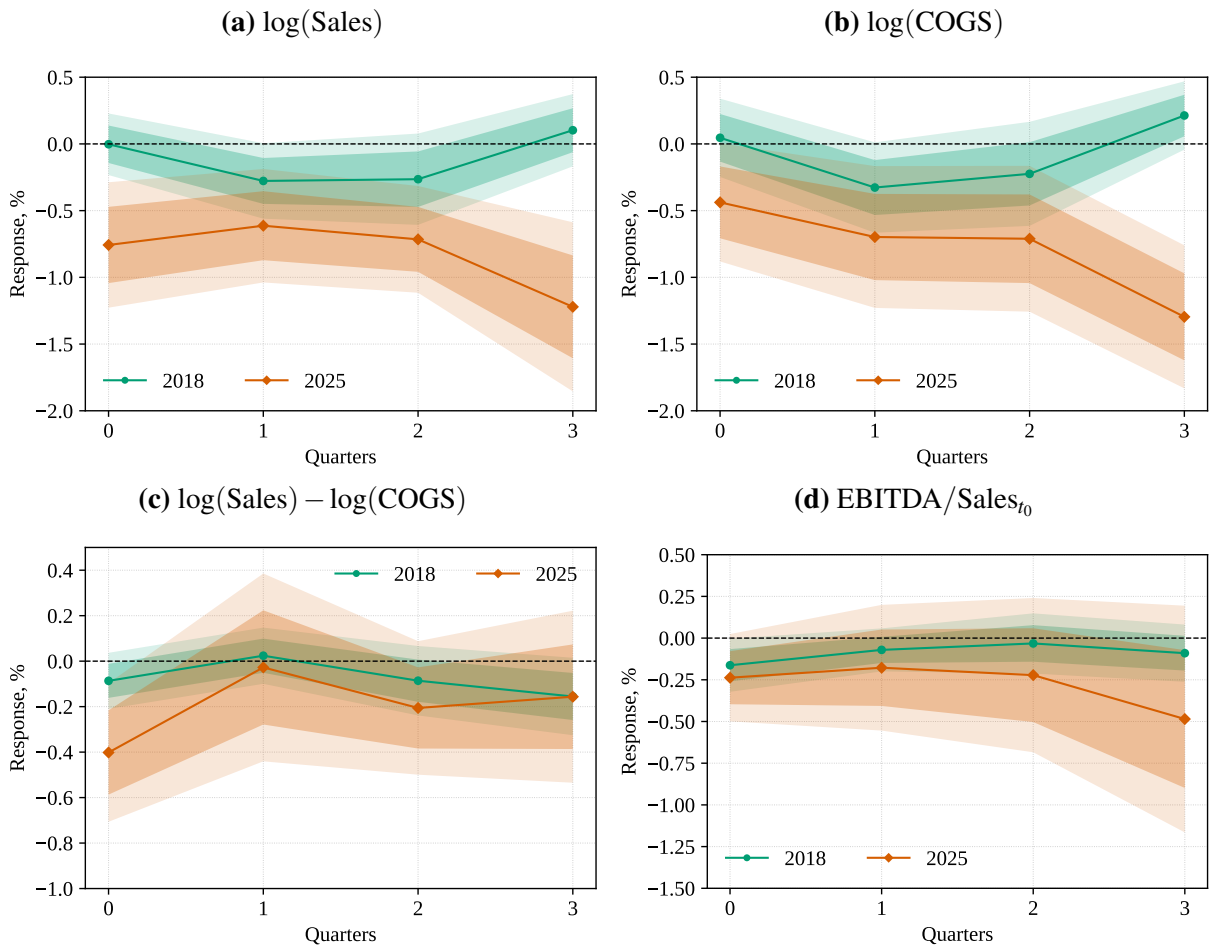
6.2.1 Beyond the Income Statement

Figure 10 reports the 2025 responses for a broader set of outcomes two quarters after the first tariff shock.[26] We examine a variety of balance-sheet entries that capture real activity, trade credit, trade financing, and market valuations.

For the average firm exposed to direct import costs, the balance sheet shrinks, and the market value declines. Total assets; selling, general, and administrative (SG&A) expenses (overhead);

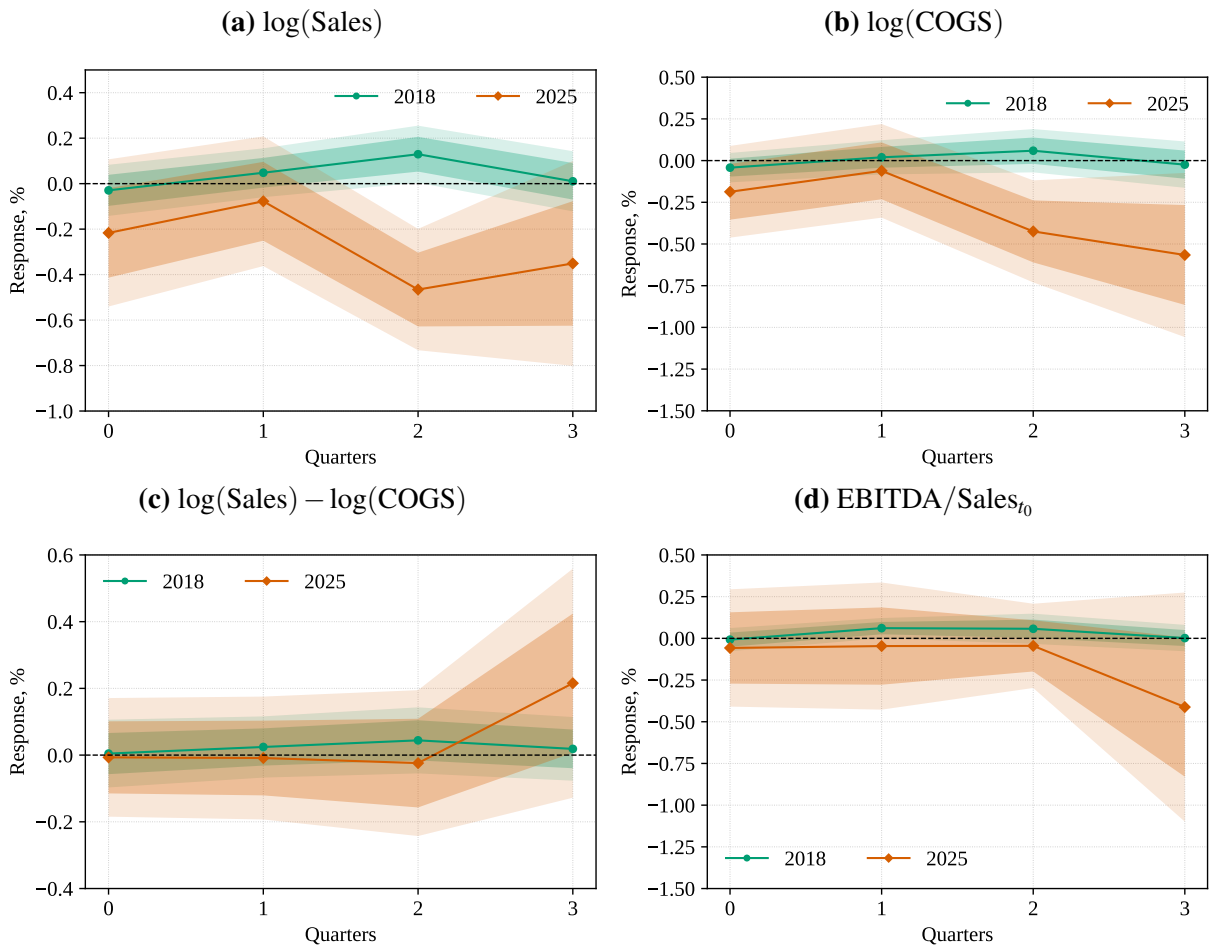
[26] Figure B.4 in Appendix B shows the responses three quarters ahead. The point estimates are qualitatively similar and often larger; three quarters ahead, CAPEX also falls for firms exposed to direct import costs, and total assets fall for firms exposed to retaliation.

Figure 7: The Effects of Import Cost Exposure on Firms' Financial Outcomes



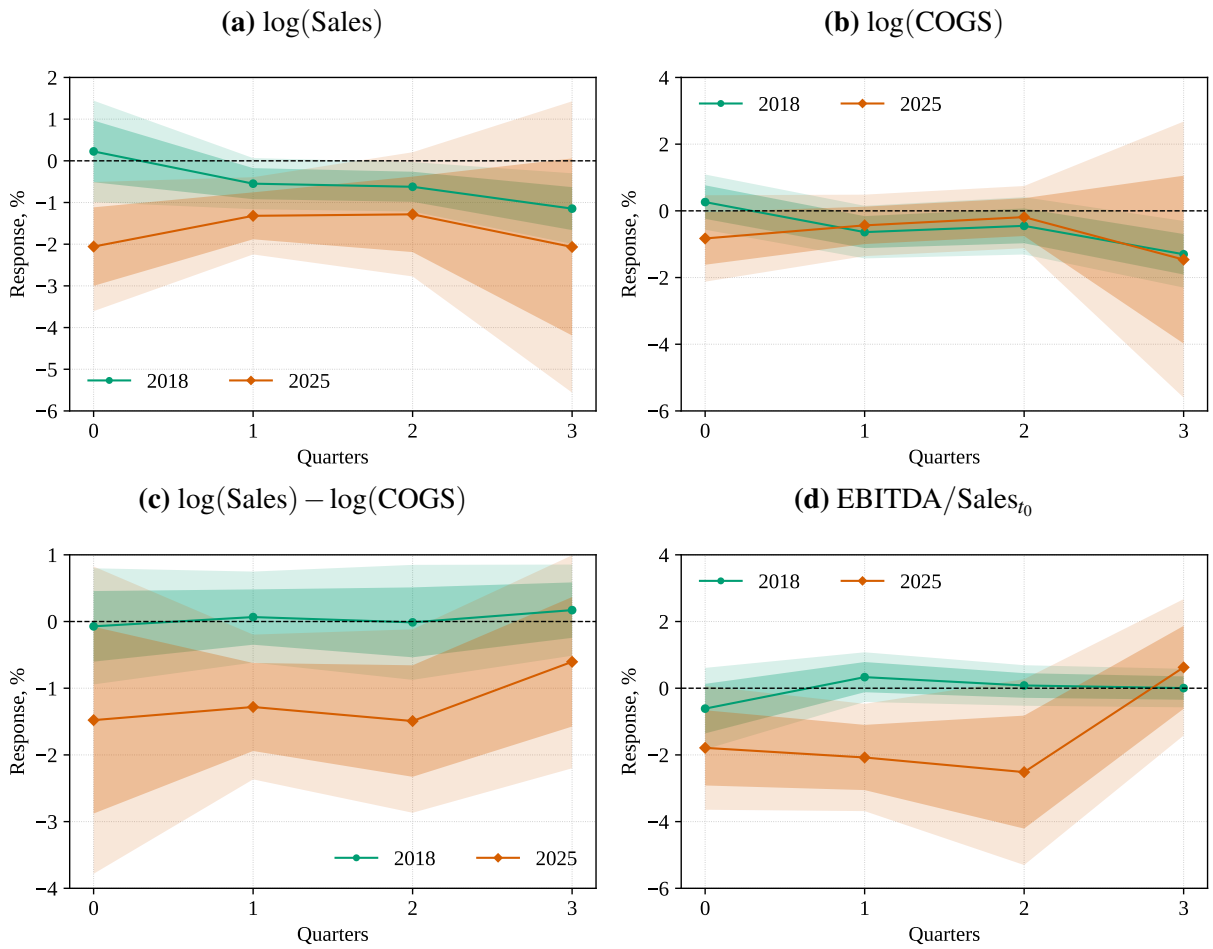
Notes: This figure shows the responses of log sales (a), log COGS (b), log sales minus log COGS (c), and EBITDA relative to pre-period sales (d) to import cost changes. Standard errors are clustered at the industry-time level. Each specification includes four lags of dependent variable, import exposure control interacted with time fixed effects, and four lags of each exposure variable plus all contemporaneous exposures. We scale all exposures to be the average of nonzero shocked firms. Confidence bands are 90 percent and 68 percent.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Figure 8: The Effects of Supplier Cost Exposure on Firms' Financial Outcomes



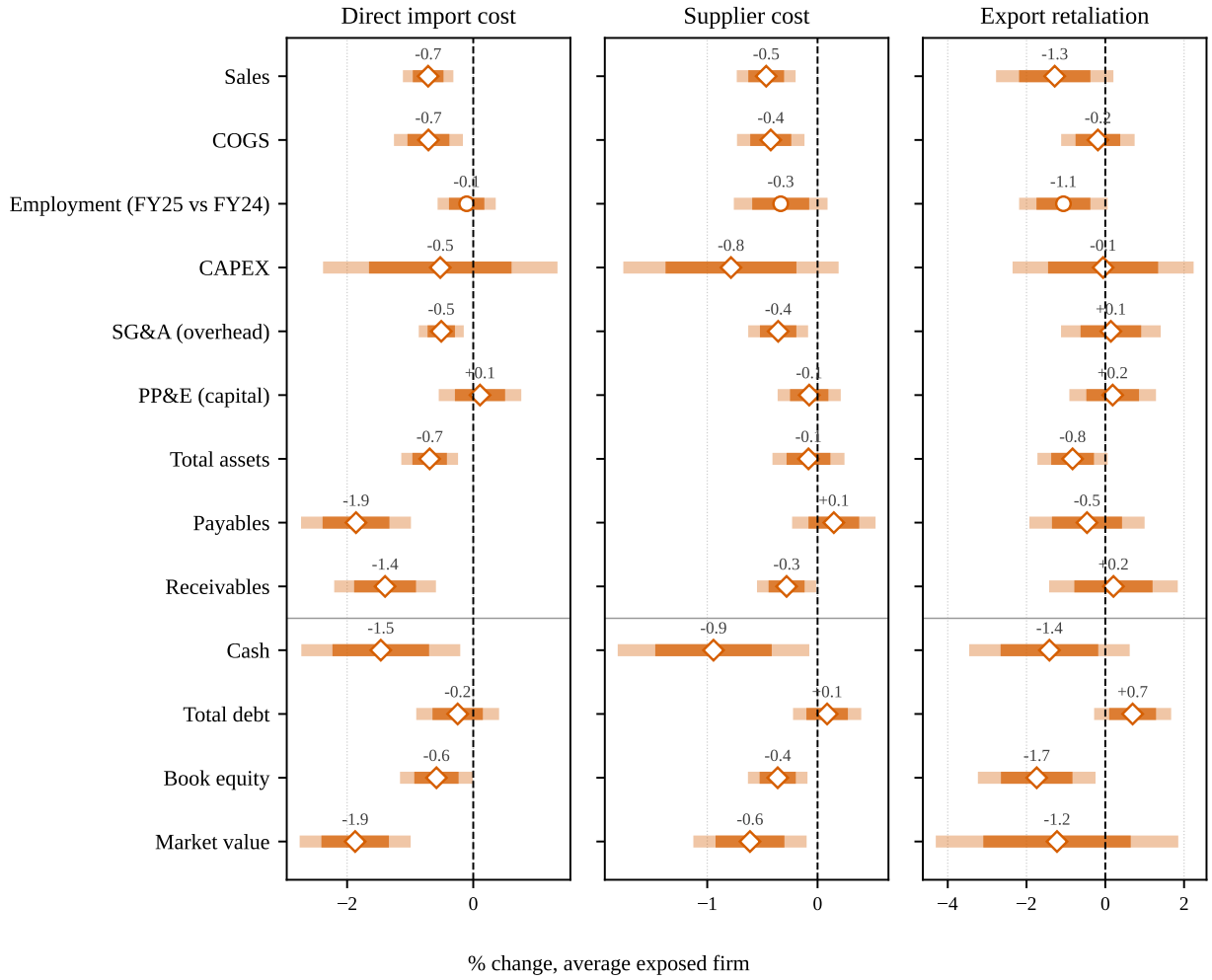
Notes: This figure shows the responses of log sales (a), log COGS (b), log sales minus log COGS (c), and EBITDA relative to pre-period sales (d) to suppliers' cost changes. Standard errors are clustered at the industry-time level. Each specification includes four lags of dependent variable, import exposure control interacted with time fixed effects, and four lags of each exposure variable plus all contemporaneous exposures. We scale all exposures to be the average of nonzero shocked firms. Confidence bands are 90 percent and 68 percent.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Figure 9: The Effects of Export Retaliation Exposure on Firms' Financial Outcomes



Notes: This figure shows the responses of log sales (a), log COGS (b), log sales minus log COGS (c), and EBITDA relative to pre-period sales (d) to export retaliation changes. Standard errors are clustered at the industry-time level. Each specification includes four lags of dependent variable, import exposure control interacted with time fixed effects, and four lags of each exposure variable plus all contemporaneous exposures. We scale all exposures to be the average of nonzero shocked firms. Confidence bands are 90 percent and 68 percent.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Figure 10: The Effects of Tariff Exposures on Firms' Financial Outcomes



Notes: This figure shows the responses of firm outcomes two quarters after the first tariff shock of the 2025 episode to direct import cost (left), supplier cost (center), and export retaliation (right) exposures. The estimates are based on the local projections in Equation (9). Each panel scales the coefficients to the average exposure of the firms with nonzero exposure to that channel. The responses are in log differences. For CAPEX, payables, receivables, and total debt (each relative to the firm's pre-period total assets), the change is the ratio divided by its 2024 mean. Employment is measured at the fiscal-year end and includes employees of foreign subsidiaries as well as domestic employees. The employment responses compare fiscal year 2025 with fiscal year 2024. These estimates are obtained using the baseline specification estimated at a fiscal-year frequency with standard errors clustered by firms. The horizontal bars represent 90 percent (lighter) and 68 percent (darker) confidence intervals. Standard errors are clustered at the firm level for employment and at the industry-time level for all other variables.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

payables; receivables; and book equity fall significantly. The market value falls by about 2 percent, in line with the firm's losing revenues. Employment and investment change little, and neither estimate is statistically significant.[27] We find no evidence that the firms increase borrowing. By contrast, the supplier cost and export retaliation exposures do not have a significant effect on the size of the balance sheet, employment, or investment. This result emerges despite the fact that sales fall (Figures 8 and 9).

Taken together, these results could indicate that firms perceive these shocks differently. An increase in the direct import cost is immediate and certain. Therefore, firms pass these costs to their customers and scale down operations. Their market value falls by more than their book equity, in expectation of permanent losses. By contrast, the supplier costs rise gradually through renegotiated contract prices. The export retaliation is immediate but, by and large, short-lived. For instance, Canada removed most of its counter-tariffs in September 2025. In response to such a shock, firms draw on liquid buffers rather than downsize, thereby preserving their capacity and trade relationships while waiting for the shock to reverse or searching for alternative suppliers and markets. Exporters may also have little room to pass retaliatory tariffs through, as they compete with non-taxed foreign producers in their destination markets.

7 Theoretical Implications

Our main empirical results in Section 6 highlight that, during the 2025 tariff episode, firms' sales and COGS both declined in the same proportion in response to cost increases via the direct and supplier channels. In contrast, both sales and COGS stayed constant in response to cost increases during the 2018 tariff episode. In both episodes, however, the ratio of sales over costs did not move, while EBITDA moved in tandem with the scale of production. Export retaliation instead reduced sales by more than costs.

In this section, we examine what theory can explain our main empirical results. We focus on firms' responses in partial equilibrium; that is, we take as given prices and quantities in other markets. This is consistent with our empirical strategy, which controls for firm and industry-time fixed effects, effectively leaving out any industry-time-varying shocks or time-invariant firm characteristics.

Model Setup. We consider a general model in which firm f in industry i has access to a production technology of the form $Q^s_{fi} = Q^s_{fi}(X_{fi}, Z^s_{fi})$, where $X_{fi} = \{X_{fi,j}\}_{j \in \mathcal{J}_{fi}}$ is a vector of inputs and Z^s_{fi}

[27] Compustat reports employment only once a year, as the number of employees at the end of the fiscal year. For about four in five firms in our sample, the fiscal year ends in December; thus, the responses compare the headcount at the end of 2025 with that at the end of 2024. We estimate the baseline specification at a fiscal-year frequency, rather than quarterly, for fiscal years 2023 through 2025. Standard errors are clustered by firms. Employment is consolidated and includes the employees of all subsidiaries, foreign and domestic.

is a production function shifter. We let $W = \{W_j\}_{j \in \mathscr{J}_{fi}}$ be the vector of input prices used by the firm.

We first focus on the firm's cost-minimization problem, which yields the variable cost function

$$VC_{fi}(W, Z^s_{fi}, \bar{Q}^s_{fi}) = \min_{X_{fi}} \left\{ \sum_{j \in \mathscr{J}_{fi}} W_j X_{fi,j} \quad \text{s.t.} \quad Q^s_{fi}(X_{fi}, Z^s_{fi}) \geq \bar{Q}^s_{fi} \right\}, \tag{10}$$

which depends on input prices (W), the production function shifter (Z^s_{fi}), and the scale of production ($\bar{Q}^s_{fi}$).

We assume that demand for firm f, industry i output, Q^d_{fi}, satisfies

$$Q^d_{fi} = Q^d_{fi}(P_{fi}, Z^d_{fi}), \tag{11}$$

where P_{fi} is the price set by firm f in industry i, and Z^d_{fi} is a firm-level shifter in demand.[28] Note that, without loss of generality, this demand shifter contains any shifter that affects firm demand, including aggregate and industry-level shifters common to all firms within an industry. For now, we leave it unspecified. We define firm sales as $S_{fi} = P_{fi} Q_{fi}$.

Given the variable cost function and the firm's demand in Equation (11), the firm maximizes variable profit:

$$\Pi_{fi}(W, Z^s_{fi}, Z^d_{fi}) = \max_{Q_{fi}} \left\{ P_{fi} Q_{fi} - VC_{fi}(W, Z^s_{fi}, Q_{fi}) \quad \text{s.t.} \quad \text{Equation (11)} \right\}. \tag{12}$$

For future reference, we define the variable profits-to-sales ratio as $\pi_{fi} = \frac{\Pi_{fi}}{S_{fi}}$.

The program in Equation (12) delivers a pricing condition that satisfies

$$P_{fi}(W, Z^s_{fi}, Z^d_{fi}) = M_{fi}(Q^d_{fi}(P_{fi}, Z^d_{fi})) MC_{fi}(W, Z^s_{fi}, Q^d_{fi}(P_{fi}, Z^d_{fi})), \tag{13}$$

where $MC_{fi} = \frac{\partial VC_{fi}}{\partial Q_{fi}}$ is a firm's marginal cost, and $M_{fi} = \frac{\varepsilon^{Q^d}_P}{\varepsilon^{Q^d}_P + 1}$ is a firm's markup that depends on the price elasticity of demand, $\varepsilon^{Q^d}_P = \frac{\partial \log Q^d_{fi}}{\partial \log P_{fi}}$. For the markup to be well defined, we require $\varepsilon^{Q^d}_P < -1$. As a general rule, we denote elasticities as $\varepsilon^X_Y = \frac{\partial \log X}{\partial \log Y}$.

Change in Input Costs We are now ready to study how our cost channels affect sales, costs, and profits. We capture a tariff increase or an increase in supplier cost as a change in a given input price W_j. We let $x = \log X$ and $\hat{x}$ denote a (log) change in a given variable X. The following

[28] Given our partial equilibrium approach, this can be understood as the residual demand faced by the firm within the industry.

proposition characterizes variable costs, sales, and variable profits-to-sales ratios under constant markups, which encompasses both perfect and monopolistic competition.

Proposition 1 (Responses of Costs, Sales, and Profits to Input Cost Shocks)**.** *Under constant markups and no other shocks so that* $\hat{z}^s_{fi} = \hat{z}^d_{fi} = 0$ *and* $\hat{w}_k = 0$ *for all* $k \neq j$*, the changes in sales, costs, and variable profits-to-sales ratios in response to a change in import tariffs/supplier costs satisfy*

$$\hat{s}_{fi} = \left(\frac{(1+\varepsilon_P^{Q^d})}{1-\varepsilon_{Q^s}^{MC}\varepsilon_P^{Q^d}} \right) \varepsilon_{W_j}^{MC} \hat{w}_j, \tag{14}$$

$$\hat{vc}_{fi} = \left(1 + \frac{\varepsilon_{Q^s}^{VC}\varepsilon_P^{Q^d}\varepsilon_{W_j}^{MC}}{\Omega_{fi,j}(1-\varepsilon_{Q^s}^{MC}\varepsilon_P^{Q^d})} \right) \Omega_{fi,j}\hat{w}_j, \tag{15}$$

$$\mathrm{d}\pi_{fi} = \frac{VC_{fi}}{S_{fi}} \left(\frac{(1+(1-\varepsilon_{Q^s}^{VC})\varepsilon_P^{Q^d})\varepsilon_{W_j}^{MC}}{1-\varepsilon_{Q^s}^{MC}\varepsilon_P^{Q^d}} - \Omega_{fi,j} \right) \hat{w}_j, \tag{16}$$

where $\hat{w}_j$ *is a change in a particular input price* j *and* $\Omega_{fi,j} = \frac{W_j X_{fi,j}}{VC_{fi}}$ *is the expenditure of firm* f *on input* j *as a share of variable costs.*

Proof. See Appendix D. □

Proposition 1 is expressed in terms of elasticities and shares. It captures how the change in input costs depends on both demand- and supply-side considerations.

Common trade and macroeconomic models make sharp predictions according to this proposition. For example, suppose firms have constant returns to scale. In this case, $\varepsilon_{Q^s}^{MC} = 0$, $\varepsilon_{Q^s}^{VC} = 1$, and $\Omega_{fi,j} = \frac{\partial \log MC_{fi}}{\partial \log W_j}$ because marginal costs are independent of the scale of production. The expressions for firms' outcomes become

$$\hat{s}_{fi} = \hat{vc}_{fi} = (1+\varepsilon_P^{Q^d})\Omega_{fi,j}\hat{w}_j, \tag{17}$$

$$\mathrm{d}\pi_{fi} = 0. \tag{18}$$

In this case, since $\varepsilon_P^{Q^d} < -1$, the increase in tariffs decreases sales and variable costs in the same proportion, leaving the variable-profit ratio unchanged. Therefore, a negative effect on both variables in this environment suggests that demand for the firm's output is sufficiently elastic so that in response to a price increase, the substitution effect, which governs the decline in demand, dominates the mechanical increase in sales and costs due to the increase in unit price. Our empirical results suggest that both sales and costs decline in response to cost shocks for the average firm in

our sample. Thus, this points toward a demand elasticity larger than one (in absolute value). If COGS approximates variable costs, log sales minus log COGS equals $-\log(1-\pi_{fi})$, so it moves in the same direction as π_{fi} and stays put when π_{fi} does. Our EBITDA outcome instead scales the change in profits by pre-period sales, and to a first order $d\Pi_{fi}/S_{fi,t_0} = \pi_{fi}\hat{s}_{fi} + d\pi_{fi}$. Even with constant markups ($d\pi_{fi} = 0$), EBITDA therefore falls in proportion to sales, and by more when part of SG&A is fixed.

Model-Implied Parameters Proposition 1 maps our estimates into structural parameters. Under constant returns to scale, $\Omega_{fi,j} = \varepsilon^{MC}_{W_j}$, that is the marginal cost of the firm increases proportionally to the share of imports over variable costs. The top panel of Figure B.1 reports the responses of sales and COGS to a 1 percentage point increase in this variable cost. Under full pass-through, both responses should equal $1 + \varepsilon^{Q^d}_P$. Two quarters after the shock, sales and COGS both fall by 2.1 percent, which implies a demand elasticity of about -3.1. The same mapping applies under partial pass-through. Let $\rho \equiv \varepsilon^P_{MC}$ denote pass-through, the elasticity of the price to marginal cost. If the price rises by a fraction ρ of the increase in marginal cost and the markup absorbs the rest, $\varepsilon^M_{MC} = \rho - 1$, the elasticities of sales and variable costs to marginal cost are $\varepsilon^S_{MC} = \rho(1 + \varepsilon^{Q^d}_P)$ and $\varepsilon^{VC}_{MC} = 1 + \rho\,\varepsilon^{Q^d}_P$. Hence $\rho = 1 + \varepsilon^S_{MC} - \varepsilon^{VC}_{MC}$ and $\varepsilon^{Q^d}_P = \varepsilon^S_{MC}/\rho - 1$. Figure B.2 reports ρ, estimated from a stacked regression of sales and COGS. Two quarters after the shock, $\rho = 0.99$ and $\varepsilon^{Q^d}_P = -3.1$. The point estimates indicate that firms passed nearly all of the tariff through to their own prices, but the confidence intervals are wide.

These results are notable because they point to high pass-through in a sample of large US public firms, precisely the firms that oligopolistic models with variable markups predict should absorb part of their cost increases (Atkeson and Burstein 2008, Amiti, Itskhoki, and Konings 2019). Figure B.3 re-estimates the baseline allowing the response to differ between firms above and below the median of sales, industry market share, and gross markup. Sales decline in every group, the ratio of sales to COGS does not fall significantly in any of them, and none of the responses differs significantly between firms below and above the median.

Retaliation by Foreigners The model also allows us to examine the effects of export retaliation on the variables considered. Without loss of generality, we can treat export retaliation as a negative demand shifter, $\hat{z}^d_{fi}$. According to this interpretation, the following result characterizes the response of all variables to a demand shock:

Proposition 2 (Responses of Costs, Sales, and Profits to Export Retaliation)**.** *Consider a shift in demand $\hat{z}^d_{fi} < 0$, with no other shocks $\hat{w}_j = 0$ for all j and $\hat{z}^s_{fi} = 0$. The responses of sales, costs,*

and variable profits-to-sales ratios are

$$\hat{s}_{fi} = \left(\frac{(1+\varepsilon_{Q^s}^{MC})}{1-\varepsilon_{Q^s}^{MC}\varepsilon_{P}^{Q^d}} \right) \varepsilon_{Z^d}^{Q^d} \hat{z}_{fi}^{d}, \tag{19}$$

$$\hat{vc}_{fi} = \left(\frac{\varepsilon_{Q^s}^{VC}}{1-\varepsilon_{Q^s}^{MC}\varepsilon_{P}^{Q^d}} \right) \varepsilon_{Z^d}^{Q^d} \hat{z}_{fi}^{d}, \tag{20}$$

$$\mathrm{d}\pi_{fi} = \frac{VC_{fi}}{S_{fi}} \left(\frac{1+\varepsilon_{Q^s}^{MC}-\varepsilon_{Q^s}^{VC}}{1-\varepsilon_{Q^s}^{MC}\varepsilon_{P}^{Q^d}} \right) \varepsilon_{Z^d}^{Q^d} \hat{z}_{fi}^{d}. \tag{21}$$

Proof. See Appendix D. □

Proposition 2 shows that a fall in foreign demand reduces sales. Under constant returns, prices do not change, so costs fall in the same proportion as sales and their ratio stays put. This is the model that fits the cost channels, but it does not fit retaliation in the short run. Over the first three quarters, sales fall by more than 1 percent, COGS barely moves, and the ratio falls by 1.3 to 1.5 percent. What could explain these effects?

One explanation is that some costs do not fall with output in the short run, that is, $\varepsilon_{Q^s}^{VC}$ is small. Cost per unit sold then rises as sales fall, so the ratio of sales to COGS falls even at a constant markup (Equation (21)). On its own, however, this would also lower the ratio after import cost shocks, which we see only on impact. What may differ across channels is how long firms expect the shock to last. Firms facing a lasting increase in import costs cut their inputs, while firms facing retaliation they expect to be reversed keep inputs and contracts in place. Our static model does not capture this distinction.

A second possibility is that exporters absorb part of the tariff by cutting prices, because they compete abroad with producers who do not pay it. Sales then fall through lower prices while quantities, and so COGS, hold up. This is a fall in the markup on foreign sales, which our constant-markup model rules out. Our data cannot separate the two explanations.

8 Conclusion

This paper studies the firm-level effects of the 2018 and 2025 US tariff episodes. Combining S&P Panjiva bill-of-lading data with Compustat financial statements and Factset supply chain and revenue data, we construct firm-level measures of exposure across three channels: direct import costs, upstream suppliers' costs, and retaliatory tariffs on exports. These measures, validated using stock returns and earnings call sentiment, reveal that the 2025 episode represents a direct import cost shock roughly 10 times larger than that of the 2018 episode, with a comparatively muted

retaliatory response. Even firms without any direct imports of their own could still be exposed to tariffs via their suppliers, though larger firms were more exposed across all measures.

During the 2018 episode, all three channels had virtually no effect on firm sales, costs, their ratio, and investment. During the 2025 episode, import cost and supplier cost exposure each reduced firm sales and variable costs by approximately 0.4 to 1.3 percent for a firm with average exposure, leaving their ratio unchanged. EBITDA point estimates fell with scale, and CAPEX did not respond two quarters after the shock. Across both episodes, the stable ratio of sales to costs aligns with a model of constant markups in which tariffs pass through to prices and generate quantity contractions. Firms lose profits through volume rather than through markups. Export retaliation is the exception. Sales fall while costs do not in the first quarters, so gross margins compress, consistent with firms keeping capacity through a shock they expect to be temporary, or with exporters absorbing part of the tariff.

References

Alfaro, Laura, Mariya Brussevich, Camelia Minoiu, and Andrea Presbitero. 2025. "Bank Financing of Global Supply Chains." NBER Working Papers 33754, National Bureau of Economic Research.

Alfaro, Laura, and Davin Chor. 2023. "Global Supply Chains: The Looming 'Great Reallocation'." NBER Working Papers 31661, National Bureau of Economic Research.

Amiti, Mary, Matthieu Gomez, Sang Hoon Kong, and David E. Weinstein. 2022. "Trade Protection, Stock-Market Returns, and Welfare." *NBER Working Paper* .

Amiti, Mary, Oleg Itskhoki, and Jozef Konings. 2019. "International Shocks, Variable Markups, and Domestic Prices." *Review of Economic Studies* 86 (6): 2356–2402.

Amiti, Mary, Sang Hoon Kong, and David Weinstein. 2020. "The Effect of the U.S.-China Trade War on U.S. Investment." NBER Working Papers 27114, National Bureau of Economic Research.

Amiti, Mary, Stephen J. Redding, and David E. Weinstein. 2020. "Whos Paying for the US Tariffs? A Longer-Term Perspective." *AEA Papers and Proceedings* 110: 541–546.

Atkeson, Andrew, and Ariel Burstein. 2008. "Pricing-to-Market, Trade Costs, and International Relative Prices." *American Economic Review* 98 (5): 1998–2031.

Barbiero, Omar. 2023. "The Channels of International Comovement." Research Department Working Papers 23-16, Federal Reserve Bank of Boston.

Barbiero, Omar, and Hillary Stein. 2025. "The Impact of Tariffs on Inflation." *Federal Reserve Bank of Boston Current Policy Perspectives* 25 (2).

Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding, and Peter K. Schott. 2018. "Global Firms." *Journal of Economic Literature* 56 (2).

Carreras-Valle, Maria Jose, and Sang Min Lee. 2026. "Tariff Front-Running." *Working Paper* .

Cavallo, Alberto, Gita Gopinath, Brent Neiman, and Jenny Tang. 2021. "Tariff Pass-Through at the Border and at the Store: Evidence from US Trade Policy." *American Economic Review: Insights* 3 (1): 19–34.

Cavallo, Alberto, Paola Llamas, and Franco Vazquez. 2025. "Tracking the Short-Run Price Impact of U.S. Tariffs." Working paper, Harvard Business School.

Clayton, Christopher, Antonio Coppola, Matteo Maggiori, and Jesse Schreger. 2025. "Geoeconomic Pressure." NBER Working Papers 34020, National Bureau of Economic Research.

Fajgelbaum, Pablo, Pinelopi Goldberg, Patrick Kennedy, Amit Khandelwal, and Daria Taglioni. 2024. "The US-China Trade War and Global Reallocations." *American Economic Review: Insights* 6 (2): 295–312.

Fajgelbaum, Pablo D, Pinelopi K Goldberg, Patrick J Kennedy, and Amit K Khandelwal. 2020. "The Return to Protectionism." *Quarterly Journal of Economics* 135 (1): 1–55.

Flaaen, Aaron, Flora Haberkorn, Logan Lewis, Anderson Monken, Justin Pierce, Rosemary Rhodes, and Madeleine Yi. 2023. "Bill of lading data in international trade research with an application to the COVID-19 pandemic." *Review of International Economics* 31 (3): 1146–1172.

Flaaen, Aaron, Ali Hortaçsu, and Felix Tintelnot. 2020. "The Production Relocation and Price Effects of US Trade Policy: The Case of Washing Machines." *American Economic Review* 110 (7): 2103–2127.

Flaaen, Aaron, and Justin Pierce. 2024. "Disentangling the Effects of the 2018-2019 Tariffs on a Globally Connected U.S. Manufacturing Sector." *The Review of Economics and Statistics* : 1–45.

Freund, Caroline, Aaditya Mattoo, Alen Mulabdic, and Michele Ruta. 2024. "Is US Trade Policy Reshaping Global Supply Chains?" *Journal of International Economics* 152: 104011.

Gopinath, Gita, Pierre-Olivier Gourinchas, Andrea F. Presbitero, and Petia Topalova. 2025. "Changing Global Linkages: A New Cold War?" *Journal of International Economics* 153: 104042.

Handley, Kyle, Fariha Kamal, and Ryan Monarch. 2025. "Rising Import Tariffs, Falling Exports: When Modern Supply Chains Meet Old-Style Protectionism." *American Economic Journal: Applied Economics* 17 (1): 208–238.

Hassan, Tarek A, Stephan Hollander, Laurence van Lent, and Ahmed Tahoun. 2019. "Firm-Level Political Risk: Measurement and Effects." *Quarterly Journal of Economics* 134 (4): 2135–2202.

Hassan, Tarek A, Jesse Schreger, Markus Schwedeler, and Ahmed Tahoun. 2023. "Sources and Transmission of Country Risk." *Review of Economic Studies* 91 (4): 2307–2346.

Huo, Zhen, Andrei A. Levchenko, and Nitya Pandalai-Nayar. 2025. "International Comovement in the Global Production Network." *Review of Economic Studies* 92 (1): 365–403.

Jordà, Òscar. 2005. "Estimation and inference of impulse responses by local projections." *American Economic Review* 95 (1): 161–182.

Online Appendix *(not for publication)*

A Additional Tables

Table A.1: Average Exposure by Sales Percentile Bin

	Sales Percentile Bin			
	p0-50	p50-75	p75-90	p90-100
Panel A: 2018 Episode				
Import Intensity (%)	2.68	4.56	5.03	7.10
Import Cost (%)	0.09	0.18	0.19	0.22
Supplier Cost (%)	0.04	0.07	0.10	0.17
Export Retaliation (%)	0.18	0.31	0.39	0.53
N	1443	721	432	289
Panel B: 2025 Episode				
Import Intensity (%)	2.50	3.73	4.63	5.36
Import Cost (%)	0.54	0.76	0.90	0.87
Supplier Cost (%)	0.15	0.26	0.37	0.55
Export Retaliation (%)	0.29	0.40	0.53	0.65
N	1541	770	462	309

Notes: This figure shows the average exposure by sales percentile bin for each episode. Sales percentile bins are based on sales, as in Compustat, in the year before the episode. Supplier cost statistics are computed over firms covered by the FactSet supply chain data.

Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Table A.2: Co-movement of Firm Sentiment with Tariff Exposure Channels, Cross Section

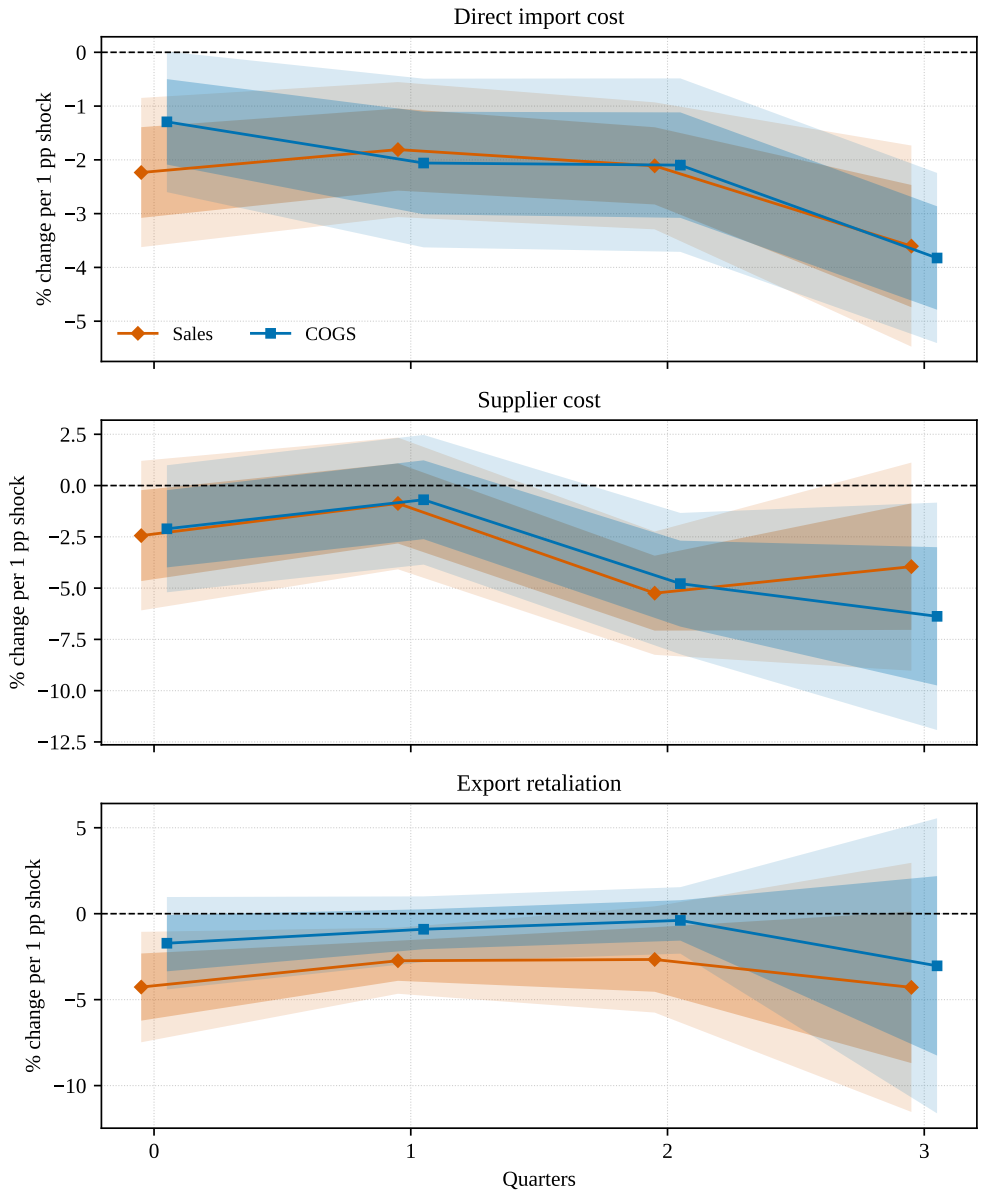
	2018 Episode			2025 Episode		
	(1) Exposure	(2) Negative	(3) Risk	(4) Exposure	(5) Negative	(6) Risk
Import Cost	0.225***	0.258***	0.737***	0.090***	0.092***	0.268***
	(0.030)	(0.038)	(0.134)	(0.009)	(0.011)	(0.037)
Suppliers' Cost	0.376***	0.421***	1.478***	0.122***	0.147***	0.515***
	(0.098)	(0.130)	(0.371)	(0.023)	(0.031)	(0.110)
Export Retaliation	0.037**	0.068***	0.135**	0.073***	0.097***	0.312***
	(0.018)	(0.026)	(0.057)	(0.011)	(0.016)	(0.060)
R^2	0.087	0.090	0.092	0.157	0.122	0.070
Firms	1,907	1,907	1,907	2,168	2,168	2,168

Notes: The exposure, negative, and risk sentiment measures are defined as in Equations (6) through (8). Robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

B Additional Figures

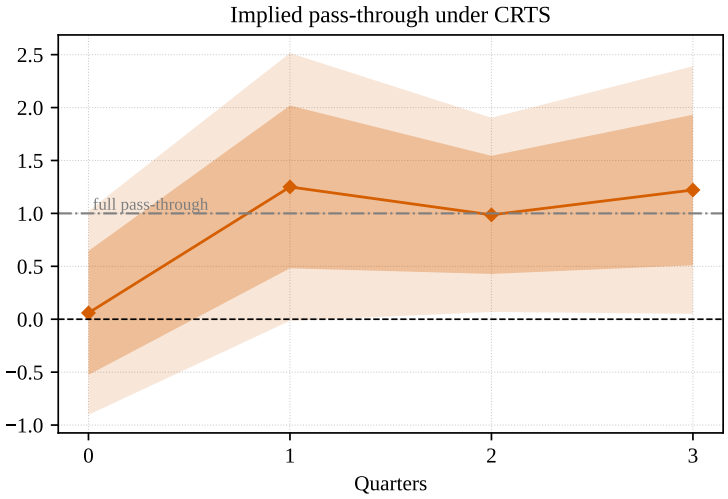
Figure B.1: The Effects of Tariff Exposure on Sales and Costs, 2025



Notes: This figure shows the responses of sales and COGS to direct import cost (top), supplier cost (middle), and export retaliation (bottom) exposures in the 2025 episode, from the local projections in Equation (9). Responses are the percent change from a 1 percentage point increase in each exposure: tariffs equal to 1 percent of US costs (direct import cost), suppliers' tariffs equal to 1 percent of their sales (supplier cost), and a 1 percent retaliatory tariff on revenue (export retaliation). Standard errors are clustered at the industry-time level. Confidence bands are 90 percent and 68 percent.

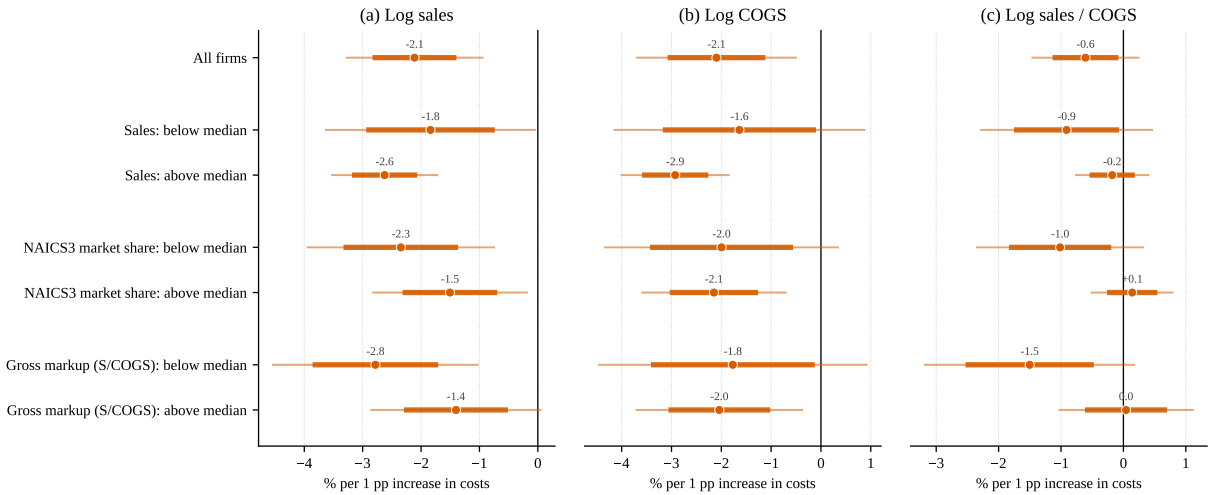
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Figure B.2: Implied Pass-Through under Constant Returns to Scale, 2025



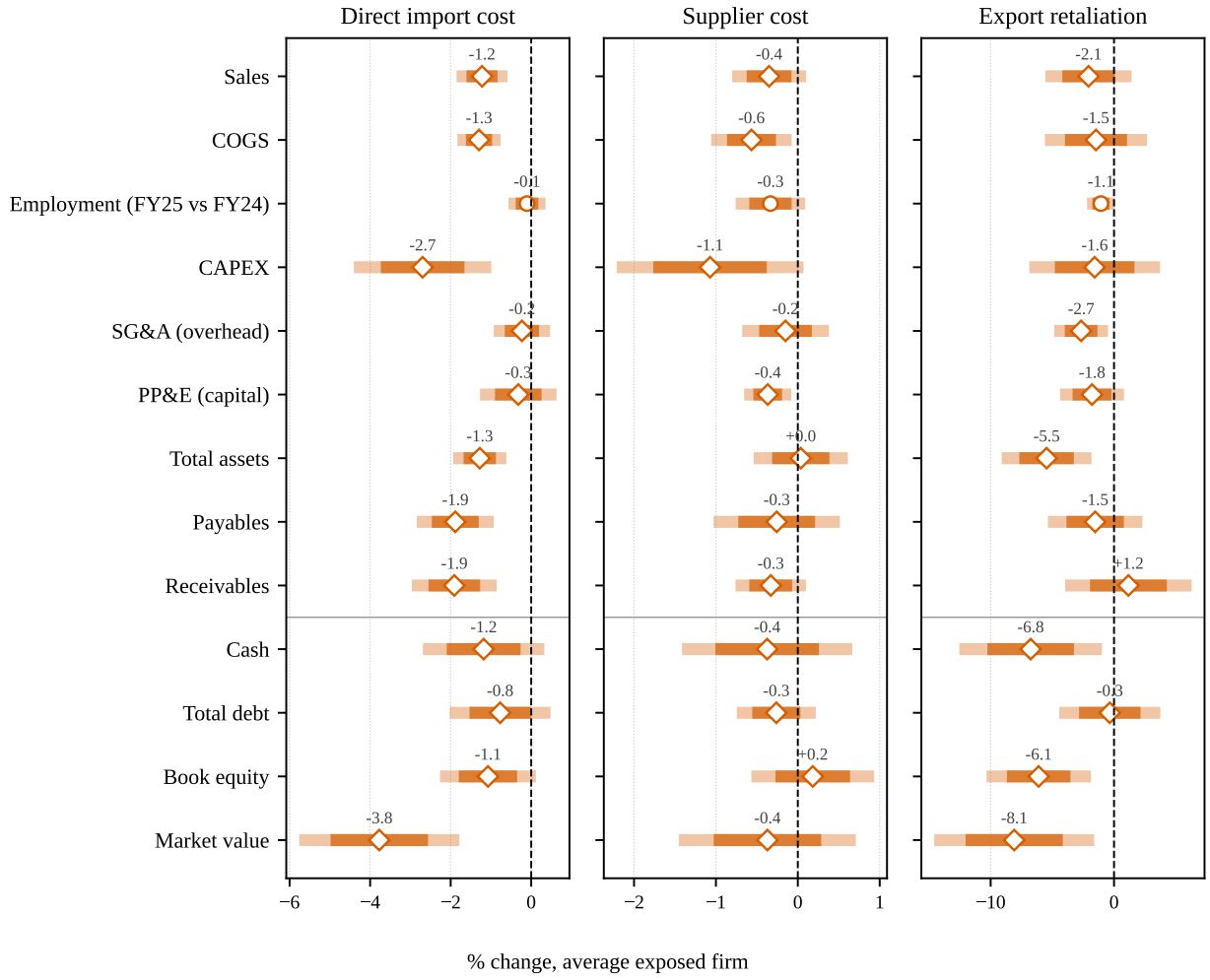
Notes: This figure shows the estimated pass-through rate ρ of direct import cost exposure in the 2025 episode. With constant returns, a tariff worth 1 percent of costs raises marginal cost by 1 percent and the price by $\rho = \varepsilon^{P}_{MC}$ percent, so sales move by $\varepsilon^{S}_{MC} = \rho(1+\varepsilon^{Q^d}_{P})$ percent and COGS by $\varepsilon^{VC}_{MC} = 1+\rho\,\varepsilon^{Q^d}_{P}$ percent, where $\varepsilon^{Q^d}_{P} < -1$ is the price elasticity of demand (Section 7); their difference, the markup response $\varepsilon^{M}_{MC} = \varepsilon^{S}_{MC} - \varepsilon^{VC}_{MC} = \rho - 1$, measures how much of the cost increase reached prices ($\rho = 0$: the markup falls by the full 1 percent; $\rho = 1$: unchanged). Sales and COGS are estimated in one stacked regression on a common sample, so the covariance of the two coefficients is known; because ρ is linear in the two coefficients, its standard error follows exactly. Standard errors are clustered at the industry-time level. Confidence bands are 90 percent and 68 percent.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Figure B.3: Responses to Direct Import Costs by Firm Size and Market Power, 2025



Notes: This figure shows the responses of log sales (panel a), log COGS (panel b), and the log ratio of sales to COGS (panel c) two quarters after a direct import cost shock worth 1 percent of costs, in the 2025 episode. "All firms" is the local projection in Equation (9). The other rows come from a single local projection in which the three shocks and their lags are interacted with indicators for being below or above the median of 2024 sales, NAICS3 market share, and gross markup (sales over COGS), with one regression per characteristic. Lags of the outcome are common to the two groups, and the regression adds group-by-quarter fixed effects to the fixed effects in Equation (9). Medians are computed among firms exposed to the shock. Standard errors are clustered at the industry-time level. Bars are 90 percent (thin) and 68 percent (thick) confidence intervals.
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

Figure B.4: The Effects of Tariff Exposure on Firms' Size and Financial Position, Three Quarters Ahead



Notes: This figure shows the responses of firm outcomes three quarters after the first tariff quarter of the 2025 episode to direct import cost (left), supplier cost (center), and export retaliation (right) exposures, from the local projections in Equation (9). Each panel scales the coefficients to the average exposure among firms with nonzero exposure to that channel; horizontal scales differ across panels. Responses are in percent of the firm's 2024 level: log changes for levels; for CAPEX, payables, receivables, and total debt (each relative to the firm's pre-period total assets), the change in the ratio divided by its 2024 mean. Employment is measured only at the fiscal year end and includes employees of foreign subsidiaries; its response compares fiscal year 2025 with fiscal year 2024 headcount, from the same equation estimated at fiscal-year frequency with standard errors clustered by firm, and is the same in both figures. Bars are 90 percent (lighter) and 68 percent (darker) confidence intervals; standard errors are clustered at the industry-time level (by firm for employment).
Sources: S&P Compustat, Panjiva, Factset GeoRev, Factset Supply Chain, US Census Bureau, Department of Finance Canada, Ministry of Finance of China, authors' calculations.

C Data Appendix

C.1 Firm-level Data

C.1.1 Panjiva

Our firm-level US import data come from Panjiva and include bill-of-lading data on all US maritime imports. So that our analyses includes the substantial volume of nonmaritime trade occurring between the United States and Mexico, we supplement that data set with another Panjiva product that covers Mexican exports. It includes maritime as well as nonmaritime (for example, truck, air, pipeline, etc.) trade records between Mexico and the United States. We append the two data sets by identifying in each the unique Panjiva firm ID of the importing US firm. Since Panjiva does not provide a similar data set for Canadian exports, we are unable to account for nonmaritime trade with Canada.

The resulting data set contains the Panjiva ID of the importing US firm, the six-digit Harmonized System (HS) product code of the goods shipped, a text field containing information about the goods' origins, the country from which the shipment departed for the United States, the volume of trade in twenty-foot equivalent units (TEUs), and the Panjiva-imputed value of goods in US dollars.

Improving Shipment's Country of Origin Identification Some further work is needed to identify each shipment's country of origin. The Panjiva field *shpmtorigin* is a well-formatted string indicating the country from which the shipment departed for the United States. In many cases, this country is not the country that produced the good. Another Panjiva field, *placeofreceipt*, does indicate the location from which the good originated, yet it is poorly formatted, often containing misspelled or truncated city or country names.

Given the importance of accurately determining a good's true origin for the purpose of calculating tariffs, we extract country information from this text field. The process is as follows.

1. We comb the strings themselves to identify any known country names via fuzzy matching.

2. We systematically remove as much extraneous information as possible from the strings, leaving only what are plausibly city names.

3. We then apply a fuzzy matching algorithm to determine whether the cleaned string is plausibly a port city as listed in the UN location database.

4. We extract the country corresponding to the city. When a match cannot be identified, we default to the country in *shpmtorigin*.

5. Using US Census imports data as a point of reference, we verify that this process improves the accuracy of import origin attribution.

After this process, the modified origin variable we create enables our data to explain 76 percent of the variation in 2017 import value by country,[29] whereas the Panjiva data that use only *shpmtorigin* to identify the country of origin explain only 65 percent.

Matching Panjiva to Compustat. Panjiva firms are identified by an S&P-assigned Panjiva ID. To match Panjiva firm IDs with Compustat data, we use historical records of an S&P-provided crosswalk matching Panjiva ID to company ID, a firm identifier that is consistent across S&P data products including Compustat. We further match each company ID to that firm's ultimate parent's company ID using another crosswalk provided by S&P. For any given time, S&P provides a crosswalk for only the current maps from the company ID to the ultimate parent's company ID. We combine information from historical versions of the crosswalk to account for changes in firm ownership over time.

C.1.2 Factset Supply Chain

Factset Supply Chain collects and verifies supply chain relationship information using various sources: Form 10-K filings, conference call transcripts, company press releases, company websites, and news media reports. It provides records of supplier–customer relationships, competitors, joint ventures, creditors, and other factors that were in effect on any given date from 2003 to 2025. We exclude intracompany relationships and filter supplier–customer relationships active at any given time in 2017 or 2024.

Matching Factset and S&P Capital IQ. We then match each customer company ID from Factset with S&P Capital IQ ID, the firm identifier in Panjiva. To do so, we use the following ordered criteria of matching, as in Barbiero (2023): Legal Entity ID (or taxpayer identification number for US companies), historical CUSIP ID, and company name fuzzy matching conditional on two companies residing in the same state and country with a cosine similarity score of at least 90 percent. The master matching file contains successful matching between Factset ID and Capital IQ ID for 5.3 million companies. This enables us to match 60 percent of the companies in the Factset Supply Chain data set.

After matching the Factset IDs with the Capital IQ company IDs, we use Panjiva and Capital IQ sales and import information for both private and public companies to build the supplier cost exposure in Equation (4).

[29] This calculation omits import values for Mexico and Canada due to Panjiva's data limitations for these countries.

C.1.3 Factset Geographic Revenue

The Factset Geographic Revenue (GeoRev) data set captures revenue exposures of global entities to different countries/regions over time. Factset exploits annual reports and regulatory filings to achieve a consistent record. GeoRev covers about 72,000 entities for both 2017 and 2024. Most of these entities are publicly listed. After applying our matching strategy with Capital IQ, we cover 47,771 entities. Not all companies declare their revenue segments at the country level. For this reason, Factset harmonizes heterogeneous declarations of sales distribution across geographies at different levels of aggregation and assigns a certainty rank to each value according to whether it was declared directly by the firm, imputed from previous values, or imputed from more aggregate firm-level data.

The main advantage of this data set is the vast array of sources used to infer the geographic revenues of each company and its global coverage. The data set is not well suited for studying the extensive margin of foreign revenue exposure, as 70 percent of the country-level records have some degree of imputation, even though most of them are associated with a high to medium degree of certainty. Jointly with the industry information from Compustat, it offers the best exposure predictor available for exposure to retaliation.

C.1.4 Compustat

From Compustat, we download firm characteristics, including net sales and cost of materials. Our main results use cost of materials, sales, and capital expenditure, as reported in Compustat. We detail our transformations of these variables in Table C.1, which also details which variables come from quarterly data (that is, Compustat variable names ending in the letter "q") and which come from annual data.

From the Compustat sample, we filter for firms with invalid or outlier values, removing firms that report negative COGS and operating expenses and firms that report quarterly sales of less than $10,000 or total assets less than $100,000. We winsorize all our final independent and dependent variables at the 2.5 and 97.5 percentiles.

Compustat firms are identified by the Capital IQ identifier GVKEY, which we aggregate up to the Panjiva-provided ultimate parent company ID. We first remove from the Compustat quarterly data all subsidiary firms whose ultimate parent is observed in the Compustat data to avoid double counting. When an ultimate parent company is identified but not present in the Compustat data, a synthetic ultimate parent company ID is created by aggregating subsidiaries to their parent. To ensure accuracy in this aggregation within the quarter, subsidiary data are aggregated to the ultimate parent company ID only if all subsidiary firms reported a value for the firm characteristic in the quarter.

Table C.1: Variable Definitions

Variable	Compustat Variables	Formula	Description
Sales	saleq	log(saleq)	The Compustat variable saleq is used as a dependent variable in our analysis after a log transformation.
Costs	cogsq and cogs	log(cogsq)	The Compustat variable cogsq is used as a dependent variable in our analysis after a log transformation. We use the annual COGS reported for the fiscal year prior to a tariff episode, scaled by the US sales share obtained from GeoRev, to get US COGS. We use this to divide our firm tariff expenditure to create our firm Import Cost increase.
CAPEX	capxy		We create a quarterly flow capxq from the Compustat fiscal year-to-date variable capxy.
EBITDA	saleq, cogsq, and xsgaq	saleq-cogsq-xsgaq	We use the formula provided by Compustat to construct EBITDA as Net (saleq) minus Cost of Goods Sold (cogsq) minus Selling, General & Administrative Expense (xsgaq). Using this formula provides a more complete sample than the one provided EBITDA.

Quarterly Compustat firm characteristics are reported according to fiscal and calendar dates, with firms having varying definitions of a fiscal year. Annual Compustat data are reported according to company fiscal years, so when annualizing quarterly variables and daily Panjiva data, we aggregate according to each company's definition of the fiscal year to ensure imports and COGS are computed on the same dates for each firm's tariff shock.

D Proofs

All elasticities are evaluated at the initial allocation. To simplify notation, we suppress firm-industry subscripts whenever it causes no confusion.

Proof of Proposition 1. Since markups are constant, log-linearizing Equation (13) yields

$$\hat{p} = \hat{mc}. \tag{D.1}$$

Under the input cost shock, $\hat{z}^s = \hat{z}^d = 0$ and $\hat{w}_k = 0$ for all $k \neq j$. Hence

$$\hat{mc} = \varepsilon_{W_j}^{MC} \hat{w}_j + \varepsilon_{Q^s}^{MC} \hat{q}, \tag{D.2}$$

$$\hat{q} = \varepsilon_P^{Q^d} \hat{p}. \tag{D.3}$$

Combining these two equations with $\hat{p} = \hat{mc}$,

$$\hat{q} = \varepsilon_P^{Q^d} \left(\varepsilon_{W_j}^{MC} \hat{w}_j + \varepsilon_{Q^s}^{MC} \hat{q} \right), \tag{D.4}$$

which implies

$$\hat{q} = \frac{\varepsilon_P^{Q^d} \varepsilon_{W_j}^{MC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \hat{w}_j, \tag{D.5}$$

$$\hat{p} = \frac{\varepsilon_{W_j}^{MC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \hat{w}_j. \tag{D.6}$$

Since $S = PQ$, $\hat{s} = \hat{p} + \hat{q}$. Therefore,

$$\hat{s} = \left(\frac{1 + \varepsilon_P^{Q^d}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \right) \varepsilon_{W_j}^{MC} \hat{w}_j. \tag{D.7}$$

Next, log-linearizing variable costs yields

$$\hat{vc} = \varepsilon_{W_j}^{VC} \hat{w}_j + \varepsilon_{Q^s}^{VC} \hat{q}. \tag{D.8}$$

By Shephard's lemma,

$$\varepsilon_{W_j}^{VC} = \frac{\partial VC}{\partial W_j} \frac{W_j}{VC} = \frac{W_j X_j}{VC} \equiv \Omega_j. \tag{D.9}$$

Thus,

$$\hat{vc} = \Omega_j \hat{w}_j + \varepsilon_{Q^s}^{VC} \left(\frac{\varepsilon_P^{Q^d} \varepsilon_{W_j}^{MC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \right) \hat{w}_j \tag{D.10}$$

$$= \left(1 + \frac{\varepsilon_{Q^s}^{VC} \varepsilon_P^{Q^d} \varepsilon_{W_j}^{MC}}{\Omega_j (1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d})} \right) \Omega_j \hat{w}_j. \tag{D.11}$$

Finally, since $\pi = \Pi/S = (S - VC)/S = 1 - VC/S$,

$$\mathrm{d}\pi = -\mathrm{d}\left(\frac{VC}{S}\right) = \frac{VC}{S}(\hat{s} - \hat{vc}) \tag{D.12}$$

$$= \frac{VC}{S} \left(\frac{\left(1 + (1 - \varepsilon_{Q^s}^{VC}) \varepsilon_P^{Q^d}\right) \varepsilon_{W_j}^{MC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} - \Omega_j \right) \hat{w}_j. \tag{D.13}$$

Restoring firm-industry subscripts yields Equation (14)–Equation (16). □

Proof of Proposition 2. Since markups are constant, Equation (D.1) still holds. Under the demand shock, $\hat{w}_j = 0$ for all j and $\hat{z}^s = 0$. Hence,

$$\hat{mc} = \varepsilon_{Q^s}^{MC} \hat{q}, \tag{D.14}$$

$$\hat{q} = \varepsilon_P^{Q^d} \hat{p} + \varepsilon_{Z^d}^{Q^d} \hat{z}^d. \tag{D.15}$$

Using $\hat{p} = \hat{mc}$,

$$\hat{q} = \varepsilon_P^{Q^d} \varepsilon_{Q^s}^{MC} \hat{q} + \varepsilon_{Z^d}^{Q^d} \hat{z}^d, \tag{D.16}$$

so

$$\hat{q} = \frac{\varepsilon_{Z^d}^{Q^d}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \hat{z}^d, \tag{D.17}$$

$$\hat{p} = \frac{\varepsilon_{Q^s}^{MC} \varepsilon_{Z^d}^{Q^d}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \hat{z}^d. \tag{D.18}$$

Since $S = PQ$,

$$\hat{s} = \hat{p} + \hat{q} = \left(\frac{1 + \varepsilon_{Q^s}^{MC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \right) \varepsilon_{Z^d}^{Q^d} \hat{z}^d. \tag{D.19}$$

Moreover,

$$\hat{vc} = \varepsilon_{Q^s}^{VC} \hat{q} = \left(\frac{\varepsilon_{Q^s}^{VC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \right) \varepsilon_{Z^d}^{Q^d} \hat{z}^d. \tag{D.20}$$

Finally, using $\pi = 1 - VC/S$,

$$\mathrm{d}\pi = \frac{VC}{S} (\hat{s} - \hat{vc}) \tag{D.21}$$

$$= \frac{VC}{S} \left(\frac{1 + \varepsilon_{Q^s}^{MC} - \varepsilon_{Q^s}^{VC}}{1 - \varepsilon_{Q^s}^{MC} \varepsilon_P^{Q^d}} \right) \varepsilon_{Z^d}^{Q^d} \hat{z}^d. \tag{D.22}$$

Restoring firm-industry subscripts yields Equation (19)–Equation (21). □